

No. 14711

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United States  
Court of Appeals  
for the Ninth Circuit

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THE COLEMAN COMPANY, INC., a corpora-  
tion, Appellant,  
vs.

HOLLY MANUFACTURING COMPANY, a cor-  
poration, Appellee.

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Transcript of Record

In Three Volumes

VOLUME I.

(Pages 1 to 368, inclusive.).

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Appeal from the United States District Court for the Southern  
District of California, Central Division

FILED

AUG 30 1955

PAUL P. O'BRIEN, CLERK



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Court of Appeals  
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Appellant,

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[Clerk's Note: When deemed likely to be of an important nature, errors or doubtful matters appearing in the original certified record are printed literally in *italic*; and, likewise, cancelled matter appearing in the original certified record is printed and cancelled herein accordingly. When possible, an omission from the text is indicated by printing in *italic* the two words between which the omission seems to occur.]

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## NAMES AND ADDRESSES OF ATTORNEYS

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Los Angeles 17, California.

For Appellee:

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RICHARD B. HOEGH,  
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Pasadena 1, California. [1\*]

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\* Page numbers appearing at foot of page of original Transcript of Record.



In the United States District Court, Southern District of California, Central Division

Civil Action No. 15886—WM

HOLLY MANUFACTURING COMPANY, a corporation of California, Plaintiff,

vs.

THE COLEMAN COMPANY, INC., a corporation of Kansas, Defendant.

COMPLAINT FOR INFRINGEMENT OF LETTERS PATENT OF THE UNITED STATES,  
No. 2,602,441

Comes Now the Plaintiff through its attorney and for cause of action against the Defendant alleges:

1. That Plaintiff Holly Manufacturing Company is a corporation organized and existing under and by virtue of the laws of the State of California, and having a principal place of business and a regular and established place of business at 875 South Arroyo Parkway, City of Pasadena, County of Los Angeles and State of California.

2. That Defendant The Coleman Company, Inc., is a corporation organized and existing under and by virtue of the laws of the State of Kansas, and having a principal place of business at 250 North St. Francis Avenue, Wichita 1, Kansas, and a regular and established place of business at 6506 South Stanford Avenue, City of Los Angeles, County of Los Angeles and State of California.

3. That the acts of infringement complained of

herein [2] have taken place in said City of Los Angeles, County of Los Angeles, State of California, within the Southern District of California and elsewhere throughout the United States.

4. That jurisdiction of this Court is founded upon the fact that this is an action arising under the Patent Laws of the United States, jurisdiction of this Court lying under Title 28, U.S. Code, Section 1338.

5. That Letters Patent of the United States No. 2,602,441 were duly and legally issued to Plaintiff on July 8, 1952, and since said date Plaintiff has been and still is the owner of said Letters Patent.

6. That Defendant, since the issuance of said Letters Patent on July 8, 1952, deliberately and willfully infringed said Letters Patent No. 2,602,441 by manufacturing, using and selling gas burning wall heaters embodying the inventions claimed in said Letters Patent and still is infringing, and will continue to so infringe to the irreparable damage of Plaintiff unless restrained by this Court.

7. That Plaintiff, since July 28, 1952, has placed the required statutory notice on all heaters manufactured by it in accordance with said Letters Patent of the United States No. 2,602,441, by marking each and every one of said heaters with the statutory notice "U. S. Patent No. 2,602,441".

8. That Plaintiff has given Defendant written notice of its infringement.

Wherefore, Plaintiff prays:

1. For a preliminary and permanent injunction

restraining Defendant from directly or indirectly infringing said Letters Patent of the United States No. 2,602,441.

2. For an accounting and recovery of damages for infringement of said Letters Patent of the United States No. 2,602,441.

3. For an assessment and awarding of costs and reasonable [3] attorney's fees against Defendant and for such other and further relief as to this Court may seem just and proper.

/s/ JAMES B. CHRISTIE,

Attorney for Plaintiff [4]

[Endorsed]: Filed September 23, 1953.

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[Title of District Court and Cause.]

### ANSWER

Now comes the defendant, by its attorneys, in answer to the Complaint, and admits, denies and alleges as follows:

#### I.

Defendant admits the allegations of Paragraph 1 of the Complaint herein.

#### II.

Defendant admits the allegations of Paragraph 2 of the Complaint herein.

#### III.

Defendant denies each and every of the allega-

tions of Paragraph 3 of the Complaint herein, and specifically denies that there have [5] been acts of infringement in the City of Los Angeles, County of Los Angeles, State of California, within the Southern District of California, or elsewhere in the United States.

#### IV.

Defendant admits the allegations of Paragraph 4 of the Complaint herein.

#### V.

Defendant denies each and every allegation of Paragraph 5 of the Complaint herein, except that defendant admits that Letters Patent of the United States No. 2,602,441 were issued to plaintiff on July 8, 1952, but specifically denies that said Letters Patent were duly and legally issued, and is not informed as to whether plaintiff is still the owner of said patent, and therefore denies the same and leaves plaintiff to its proof.

#### VI.

Defendant denies each and every allegation of Paragraph 6 of the Complaint herein.

#### VII.

Defendant denies each and every allegation of Paragraph 7 of the Complaint herein.

#### VIII.

Defendant admits that plaintiff has given written notice of the alleged infringement.



## IX.

Defendant denies that plaintiff is entitled to any injunction, that plaintiff has been damaged by the action of the defendant whatsoever, and for further defenses, states as follows:

A. Said Letters Patent No. 2,602,441 is void and invalid because the alleged invention thereof was patented or described in the following patents (and other patents and publications which defendant prays leave to add hereto by amendment when they become known to it) in this country or in foreign countries, before [6] the alleged invention or discovery thereof by the patentees or for more than one year prior to the application for said United States Letters Patent No. 2,602,441:

## United States Patents

| Number    | Name    | Date          |
|-----------|---------|---------------|
| 1,361,389 | McLeod  | Dec. 7, 1920  |
| 1,698,775 | Traut   | Jan. 15, 1929 |
| 2,453,954 | Wright  | Nov. 16, 1948 |
| 2,484,457 | Marble  | Oct. 11, 1949 |
| 2,487,775 | Cartter | Nov. 8, 1949  |

B. Said Letters Patent No. 2,602,441 is void and invalid because the said Letters Patent discloses no patentable invention over what was known to the art at the time of the alleged invention or discovery thereof was purported to have been made. The patents set forth in Paragraph A above and as it may be amended, illustrate the knowledge of the art at that time.

C. Said Letters Patent No. 2,602,441 is void and invalid because the patentees were not the first in-

ventors of the subject matter purported to have been patented, or any material or substantial part thereof, the alleged invention, if patentable at all, having been made prior to the patentees, by the patentees listed in Paragraph A above and by others who were using reasonable diligence in adapting and perfecting the same and by others whose names defendant prays leave to add hereto by amendment when they become known to it.

D. Said Letters Patent No. 2,602,441 is void and invalid because the purported invention thereof has been in public use or on sale in this country for more than one year prior to the effective application date of said patent by the patentees or their assignees of the United States Letters Patent set forth in Paragraph A hereof, by the assignee of said patent 2,602,441, and by others whose names defendant prays leave to add hereto by amendment when [7] they become known to it.

E. Said Letters Patent No. 2,602,441 is invalid because it is ambiguous, incomplete, and insufficient, and because, for the purpose of deceiving the public, the description of the alleged invention filed in the Patent Office was made to contain less than the whole truth relative to the alleged invention, or more than was necessary to produce the desired results; and because such description was designed to mislead the public as to the character of the alleged invention.

F. Said Letters Patent No. 2,602,441 is invalid because each of the respective claims thereof is not supported by the specification in connection with

said Letters Patent, and each of them does not, particularly point out and distinctly claim the parts, improvements, or combination that the patentee claims as his invention and discovery, and because the invention claimed in said patent is sufficiently different from any invention indicated, suggested or described with respect to the original application.

G. Said Letters Patent No. 2,602,441 is void and invalid for lack of utility and because the claims thereof are indefinite and cover structures wholly lacking in utility.

H. Said patentees, John H. Hollingsworth and Karl L. Bedell, are not the first, original and joint inventors of the invention purported to be described and claimed in said Letters Patent.

Wherefore, defendant prays:

(a) For judgment dismissing the Complaint herein;

(b) For costs, reasonable attorneys' fees, and such further relief as may be just and equitable.

Dated: November 17, 1953.

LYON & LYON,  
/s/ FREDERICK W. LYON,  
Attorneys for Defendant [8]

Affidavit of Service by Mail attached [9]

[Endorsed]: Filed November 17, 1953.

[Title of District Court and Cause.]

## FIRST SUPPLEMENTAL COMPLAINT

Comes Now the Plaintiff and for cause of action against the Defendant alleges as follows:

1. That Plaintiff Holly Manufacturing Company is a corporation organized and existing under and by virtue of the laws of the State of California, and having a principal place of business and a regular and established place of business at 875 South Arroyo Parkway, City of Pasadena, County of Los Angeles and State of California.

2. That Defendant The Coleman Company, Inc., is a corporation organized and existing under and by virtue of the laws of the State of Kansas, and having a principal place of business at 250 North St. Francis Avenue, Wichita 1, Kansas, and a regular and established place of business at 6506 South Stanford Avenue, City of Los Angeles, County of Los Angeles and State of California.

3. That the acts of infringement complained of herein have [10] taken place in said City of Los Angeles, County of Los Angeles, State of California, within the Southern District of California and elsewhere throughout the United States.

4. That jurisdiction of this Court is founded upon the fact that this is an action arising under the Patent Laws of the United States, jurisdiction of this Court lying under Title 28, U.S. Code, Section 1338.

5. That Letters Patent of the United States No.

2,602,441 were duly and legally issued to Plaintiff on July 8, 1952, and since said date Plaintiff has been and still is the owner of said Letters Patent.

6. That prior to the filing and service of the complaint herein, Defendant manufactured and sold gas-burning wall heaters designated as Defendant's Models No. 64, 67, 68 and 69 and that said wall heaters included a secondary heat exchanger four feet in length known as Defendant's 4-foot economizer and that said wall heaters embodied the inventions claimed in said Letters Patent. That since on or about November 2, 1953 Defendant has been manufacturing and selling and still is manufacturing and selling gas-burning wall heaters designated as Defendant's Models No. 64, 67, 68 and 69 and that said wall heaters manufactured and sold by Defendant since on or about November 2, 1953 have included and still include a secondary heat exchanger three feet in length known as Defendant's 3-foot economizer. That Defendant, since on or about November 2, 1953, has been and still is infringing said Letters Patent by making, using and selling gas-burning wall heaters designated as its Models No. 64, 67, 68 and 69, and will continue to so infringe said Letters Patent to the irreparable damage of the Plaintiff unless restrained by this Court.

7. That Plaintiff, since July 28, 1952, has placed the required statutory notice on all heaters manufactured by it in accordance with said Letters Patent of the United States No. 2,602,441, by marking



each and every one of said heaters with the statutory notice "U.S. Patent No. 2,602,441". [11]

Wherefore, Plaintiff prays:

1. For a preliminary and permanent injunction restraining Defendant from directly or indirectly infringing said Letters Patent of the United States No. 2,602,441.

2. For an accounting and recovery of damages for infringement of said Letters Patent of the United States No. 2,602,441.

3. For an assessment and awarding of costs and reasonable attorney's fees against Defendant and for such other and further relief as to this Court may seem just and proper.

/s/ JAMES B. CHRISTIE,

Attorney for Plaintiff [12]

[Endorsed]: Filed November 23, 1954.

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[Title of District Court and Cause.]

## ANSWER TO FIRST SUPPLEMENTAL COMPLAINT

Now comes the Defendant, by its attorneys, and in answer to the First Supplemental Complaint, admits, denies and alleges as follows:

### I.

Defendant admits the allegations of Paragraph 1 of the Complaint herein.

## II.

Defendant admits the allegations of Paragraph 2 of the Complaint herein.

## III.

Answering Paragraph 3 of the Complaint herein, Defendant [13] admits that the acts charged to infringe took place in the City of Los Angeles, County of Los Angeles, State of California, within the Southern District of California, or elsewhere throughout the United States, but specifically denies that said acts of infringement of Letters Patent No. 2,602,441 ever took place.

## IV.

Defendant admits the allegations of Paragraph 4 of the Complaint herein.

## V.

Defendant denies each and every allegation of Paragraph 5 of the Complaint herein, except that defendant admits that Letters Patent of the United States No. 2,602,441 were issued to plaintiff on July 8, 1952, but specifically denies that said Letters Patent were duly and legally issued, and is not informed as to whether plaintiff is still the owner of said patent, and therefore denies the same and leaves plaintiff to its proof.

## VI.

Defendant admits that it has manufactured and sold Models Nos. 64, 67, 68 and 69 with a 4-foot economizer thereon, but denies that said wall heaters embody the inventions claims in Letters Patent No. 2,602,441.

Defendant further admits that since November 2, 1953 Defendant has been manufacturing and selling, and still is manufacturing and selling gas burning wall heaters designated as Defendant's Models Nos. 64, 67, 68 and 69, and that since November 2, 1953 said heaters included a secondary heat exchanger three feet in length known as Defendant's 3-foot economizer, but denies that any device manufactured by Defendant and, specifically, Models Nos. 64, 67, 68 and 69, infringe Letters Patent No. 2,602,441.

## VII.

Defendant is without knowledge as to the allegations of Paragraph 7 and, therefore, denies each and every allegation thereof. [14]

## VIII.

Defendant denies that Plaintiff is entitled to any injunction, that plaintiff has been damaged by any acts of the Defendant whatsoever, and for further defenses, states as follows:

A. Said Letters Patent No. 2,602,441 is void and invalid because the alleged invention thereof was patented or described in the following patents (and other patents and publications which Defendant prays leave to add hereto by amendment when they become known to it) in this country or in foreign countries, before the alleged invention or discovery thereof by the patentees or for more than one year prior to the application for said United States Letters Patent No. 2,602,441:



## United States Patents

| Number    | Name    | Date           |
|-----------|---------|----------------|
| 1,361,389 | McLeod  | Dec. 7, 1920   |
| 1,698,775 | Traut   | Jan. 15, 1929  |
| 2,453,954 | Wright  | Nov. 16, 1948  |
| 2,484,457 | Marble  | Oct. 11, 1949  |
| 2,487,775 | Cartter | Nov. 8, 1949   |
| 139,111   | Briggs  | May 20, 1873   |
| 268,860   | Browell | Dec. 12, 1882  |
| 2,209,324 | Davison | July 30, 1940  |
| 2,491,664 | James   | Dec. 20, 1949  |
| 303,174   | Mason   | Aug. 5, 1884   |
| 2,093,492 | Snyder  | Sept. 21, 1937 |

## Foreign Patents

140,989 (British) McLeod    Apr. 8, 1920

B. Said Letters Patent No. 2,602,441 is void and invalid because the said Letters Patent discloses no patentable invention over what was known to the art at the time of the alleged invention or discovery thereof was purported to have been made. The patents set forth in Paragraph A above and as it may be amended, [15] illustrate the knowledge of the art at that time.

C. Said Letters Patent No. 2,602,441 is void and invalid because the patentees were not the first inventors of the subject matter purported to have been patented, or any material or substantial part thereof, the alleged invention, if patentable at all, having been made prior to the patentees, by the patentees listed in Paragraph A above and by others who were using reasonable diligence in adapting and perfecting the same and by others whose names

Defendant prays leave to add hereto by amendment when they become known to it.

D. Said Letters Patent No. 2,602,441 is void and invalid because the purported invention thereof has been in public use or on sale in this country for more than one year prior to the effective application date of said patent by the patentees or their assignees of the United States Letters Patent set forth in Paragraph A hereof, by the assignee of said patent 2,602,441, and by others whose names defendant prays leave to add hereto **by amendment** when they become known to it.

E. Said Letters Patent No. 2,602,441 is invalid because it is ambiguous, incomplete, and insufficient, and because, for the purpose of deceiving the public, the description of the alleged invention filed in the Patent Office was made to contain less than the whole truth relative to the alleged invention, or more than was necessary to produce the desired results; and because such description was designed to mislead the public as to the character of the alleged invention.

F. Said Letters Patent No. 2,602,441 is invalid because each of the respective claims thereof is not supported by the specification in connection with said Letters Patent, and each of them does not, particularly point out and distinctly claim the parts, improvements, or combination that the patentee claims as his invention and discovery, and because the invention claimed in said [16] patent is sufficiently different from any invention indicated,

suggested or described with respect to the original application.

G. Said Letters Patent No. 2,602,441 is void and invalid for lack of utility and because the claims thereof are indefinite and cover structures wholly lacking in utility.

H. Said patentees, John H. Hollingworth and Karl L. Bedell, are not the first, original and joint inventors of the invention purported to be described and claimed in said Letters Patent.

Wherefore, Defendant prays:

(a) For judgment dismissing the Complaint herein;

(b) For costs, reasonable attorneys' fees, and such further relief as may be just and equitable.

Dated at Los Angeles, California, this 18th day of October, 1954.

LYON & LYON,  
/s/ FREDERICK W. LYON,  
Attorneys for Defendant [17]

Affidavit of Service by Mail attached. [18]

[Endorsed]: Filed October 19, 1954.

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[Title of District Court and Cause.]

ORDER FOR FINDINGS OF FACT, CONCLUSIONS OF LAW AND INTERLOCUTORY JUDGMENT

This cause having been tried and submitted for decision and it appearing to the court

(a) that Letters Patent No. 2,602,441 in suit describe the invention of new and useful improvements [35 U.S.C. § 101] in "Wall heaters fired with gaseous fuel", and are valid as to each of claims 1, 2, 3 and 4 thereof [35 U.S.C. § 112];

(b) that as charged in plaintiff's first supplemental complaint, defendant has intentionally infringed the patent in suit by making, using and selling gas-burning wall heaters designated as defendant's Model No. 67 embodying the invention of the patent in suit; [19]

(c) that plaintiff is entitled to judgment against defendant for damages sustained as a proximate result of defendant's infringement of any of claims 1, 2, 3 and 4 of the patent in suit, to be assessed pursuant to 35 U.S.C. § 284;

(d) that plaintiff is entitled to an injunction restraining defendant and all persons designated in Rule 65(d) of the Federal Rules of Civil Procedure, for the remainder of the term for which said Letters Patent have been granted, from directly or indirectly, in any way or manner infringing, or offering or threatening to infringe, or aiding or abetting others in infringing, any of claims 1, 2, 3 and 4 of said Letters Patent;

(e) that decision on any prayer for increased damages pursuant to 35 U.S.C. § 284, or for attorney fees pursuant to *id.* § 285, should be reserved until after determination of plaintiff's damages; and

(f) that this cause should be referred to a Special Master, pursuant to Rule 53 of the Federal Rules of

Civil Procedure, with directions to hear all relevant evidence on the issue of damages to be assessed, and to report his findings of fact and conclusions of law with respect to the assessment of such damages in accordance with 35 U.S.C. § 284;

It Is Ordered that plaintiff lodge with the Clerk within ten days findings of fact, conclusions of law and interlocutory judgment accordingly, to be settled pursuant to local rule 7.

It Is Further Ordered that the Clerk this day serve [20] copies of this order by United States mail on the attorneys for the parties appearing in this cause.

January 31, 1955.

/s/ WM. C. MATHES,

U. S. District Judge [21]

[Endorsed]: Filed January 31, 1955.

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[Title of District Court and Cause.]

## FINDINGS OF FACT AND CONCLUSIONS OF LAW

Upon trial being had in open court and for good cause shown, the Court hereby makes its findings of fact and conclusions of law as follows:

1. That plaintiff, Holly Manufacturing Company, is a corporation organized and existing under the laws of the State of California and has its



principal place of business in the City of Pasadena, County of Los Angeles and State of California;

2. That defendant, The Coleman Company, Incorporated, is a corporation organized and existing under the laws of the State of Kansas and has its principal place of business in the City of Wichita, Kansas, and a regular and established place of business in the City of Los Angeles, County of Los Angeles and State of California; [22]

3. That this is an action arising under the patent laws of the United States; that this court has jurisdiction of the subject matter of the action pursuant to the provisions of section 1338 of the Judicial Code, 28 U.S.C. sec. 1338;

4. That on July 8, 1952 Letters Patent No. 2,602,441 was duly issued to plaintiff on application serial No. 222,500 filed April 25, 1951;

5. That plaintiff is the owner of all right, title and interest in and to said Letters Patent No. 2,602,441, together with all rights of action for infringement thereof;

6. That plaintiff in its complaint and first supplemental complaint charges defendant with infringement of claims 1, 2, 3 and 4 of the patent in suit;

7. That the accused devices are defendant's wall heaters models No. 64, 67, 68 and 69 and are exemplified by Exhibits 24 through 24e and Exhibits 25 through 25d; that prior to November 2, 1953 defendant's wall heaters models No. 64, 67, 68 and 69 manufactured and sold by defendant were equipped with defendant's 4-foot economizer; that

at all times from and after November 2, 1953 defendant has not manufactured and sold said heaters equipped with its 4-foot economizer; that all defendant's wall heaters models No. 64, 67, 68 and 69 manufactured and sold by defendant since November 2, 1953 have been equipped with defendant's 3-foot economizer;

8. That defendant has manufactured and sold substantial numbers of its wall heaters models No. 64, 67, 68 and 69 with both the 4-foot economizer and the 3-foot economizer;

9. That for a long time prior to the invention of the patent in suit, the thermal input of wall heaters could not be increased substantially without excessively heating combustible walls in which the heaters were installed, and that these hot walls were encountered in both the lower and upper portions of the wall between floor and ceiling adjacent the heater; that wall heater manufacturers have no [23] control of the height of flues attached to their heaters in buildings and that prior to the invention of the patent in suit, there was inadequate control of the amount of warm air sucked from the room into the flue from the draft hood and thus lost, with consequent decrease in heating efficiency; that the combination of elements described and claimed in the patent in suit cooperate to permit the thermal input of wall heaters to be increased without bringing about excessive wall temperatures at any point in the wall from floor to ceiling, and without reducing thermal efficiency of the wall heaters; and that the invention of the patent in suit has simultane-

ously solved the hot wall problem from floor to ceiling, increased thermal efficiency while permitting increased heat input, improved air circulation within the room, minimized heat loss due to warm air being sucked out of the room into the flue through the draft hood, and has rendered this heat loss substantially independent of flue height;

10. That it required the exercise of inventive faculty to invent the combination defined by each of claims 1, 2, 3 and 4 of Letters Patent No. 2,602,441 in suit;

11. That the combination of elements defined by each of claims 1, 2, 3 and 4 of Letters Patent No. 2,602,441 in suit cooperate to produce a new and beneficial result unattained before the invention of said patent was made, and that the results of such combination exceed the accumulation of the results of the individual elements of such combination;

12. That John H. Hollingsworth and Karl L. Bedell, who are named as the inventors in the patent in suit, are the original and first inventors of certain new and useful improvements in gas-burning wall heaters as claimed in each of claims 1, 2, 3 and 4 of the patent in suit;

13. That Letters Patent No. 2,602,441 in suit is valid as to each of claims 1, 2, 3 and 4 thereof; [24]

14. That the disclosure contained in Letters Patent No. 2,602,441 in suit is sufficient to enable a person skilled in the art to which the patent pertains to accomplish the objects of the invention;

15. That Letters Patent No. 2,602,441 in suit is not ambiguous, incomplete, or insufficient, and the



description of the invention filed in the Patent Office was not made to contain less than the whole truth relative to the alleged invention; that the description of the invention filed in the Patent Office was not made to contain more than was necessary to produce the desired results; that the description of the invention was not designed to mislead the public as to the character of the invention;

16. That each of claims 1, 2, 3 and 4 of Letters Patent No. 2,602,441 in suit is supported by the specification in said patent and, construed in the light of such specification, each of such claims particularly points out and distinctly claims the parts, improvements or combination of the invention; that the inventions claimed in each of claims 1, 2, 3 and 4 of said patent is not different from any inventions indicated, suggested, described or claimed in the application therefor;

17. That defendant introduced in evidence 14 prior art patents (Exhibits C through P) for the purpose of showing that the invention of the patent in suit was anticipated by the prior art; that said prior art patents, taken either singly or in combination, do not describe a gas burning wall heater wherein the principle, or mode of operation, or results attained are equivalent to those of the patent in suit; that said prior art patents, taken either singly or in combination, do not describe or suggest the group of cooperative elements described and claimed by the patent in suit; that of such exhibits, Exhibits C, D, E, F and G were cited by the Patent Office in the file wrapper of the patent in suit; that

neither the remainder of said exhibits (Exhibits H through P) nor any other prior art [25] relied upon by defendant more nearly discloses the invention of the patent in suit than do the references cited by the Patent Office in the file wrapper of said patent; that none of the prior art references, taken either singly or in combination, anticipates the invention of the patent in suit;

18. That the invention of the patent in suit represents a new and useful improvement in wall heaters fired with gaseous fuel and has provided a substantial contribution to the art;

19. That the proceedings in the Patent Office had as to the application for the patent in suit, serial No. 222,500 (defendant's Exhibit A) or the file wrapper of the abandoned application, serial No. 157,670 filed April 24, 1950 (defendant's Exhibit B), do not limit the scope of claims 1, 2, 3 or 4 of the patent in suit; that plaintiff made no admissions in either of said file wrappers which would restrict or limit the scope of claims 1, 2, 3 or 4;

20. That prior to serving and filing the complaint herein plaintiff gave written notice of infringement to the defendant;

21. That defendant's wall heaters models No. 64, 67, 68 and 69 equipped with defendant's 4-foot economizer, exemplified by Exhibits 24 through 24e, contain all the elements of each of claims 1, 2, 3 and 4 of Letters Patent No. 2,602,441 in suit;

22. That defendant's wall heaters models No. 24, 67, 68 and 69 equipped with defendant's 3-foot economizer, exemplified by Exhibits 25 through 25d,

contain all the elements of each of claims 1, 2, 3 and 4 of the patent in suit;

23. That defendant undertook the manufacture and sale of its wall heaters models No. 64, 67, 68 and 69 after defendant's New Products Committee and its design engineers had seen an exemplar of plaintiff's device which embodied the inventions of the patent in suit;

24. That defendant's wall heaters models No. 64, 67, 68 and 69 manufactured and sold by defendant prior to November 2, 1953 [26] employed defendant's 4-foot economizer which was adapted to receive air flowing upward outside the first box and inside the wall as taught and claimed by the patent in suit;

25. That after the plaintiff had sent notice of infringement of the patent in suit to the defendant, defendant represented to the plaintiff that defendant was redesigning defendant's wall heaters models No. 64, 67, 68 and 69 to prevent the flow of air upward into the second box or economizer from the conduit provided outside the first box and inside the wall, but that defendant's redesigned wall heaters models No. 64, 67, 68 and 69 which were manufactured and sold by the defendant on or after November 2, 1953 and which employed defendant's 3-foot economizer did not prevent such flow of air;

26. That defendant's wall heaters models No. 64, 67, 68 and 69 manufactured and sold by defendant on or after November 2, 1953 employed defendant's

so-called 3-foot economizer which was adapted to receive air flowing upward outside the first box and inside the wall as taught and claimed by the patent in suit;

27. That the upper radiator in all defendant's wall heaters models No. 64, 67, 68 and 69 is made substantially smaller in horizontal cross section than the first radiator in such heaters in order to minimize loss of efficiency of the heater when warm air is drawn from the room through the draft hood to dilute the combustion products in the upper radiator;

28. That all of defendant's wall heaters models No. 64, 67, 68 and 69 infringe each of claims 1, 2, 3 and 4 of Letters Patent No. 2,602,441 in suit;

29. That the inlet grilles on the defendant's devices, designated as grilles 7 and 8 on Exhibit 24a, contribute some air to the flow of air through defendant's economizers, exemplified by Exhibits 24b and 25a; that at best, such grilles function merely as an addition to the structure and do not avoid infringement; [27]

30. That defendant's infringement of claims 1, 2, 3 and 4 of the patent in suit has been and is intentional, conscious and deliberate and that defendant threatens to continue to infringe said claims and will infringe said claims unless enjoined by this court;

31. That all plaintiff's wall heaters exemplified by Exhibits 20 through 20d and Exhibit 44 embody the inventions claimed in the patent in suit;

32. That plaintiff's manufacture and sale of wall heaters exemplified by Exhibits 20 through 20d and Exhibit 44 has been commercially successful, and that defendant has had substantial commercial success in the manufacture and sale of its wall heaters models No. 64, 67, 68 and 69; and

33. That plaintiff has committed no acts which prevent it from seeking or obtaining relief in a court of equity for infringement of the patent in suit.

### Conclusions of Law

#### I.

That this Court has jurisdiction of the subject matter of the action and of the parties to the action;

#### II.

That plaintiff is entitled to damages sustained as a proximate result of defendant's infringement of each of claims 1, 2, 3 and 4 of the Letters Patent No. 2,602,441 in suit, to be assessed pursuant to the provisions of 35 U.S.C. sec. 284;

#### III.

That plaintiff is entitled to an accounting to ascertain pursuant to the provisions of 35 U.S.C. sec. 284 the amount of its damages sustained as a proximate result of defendant's infringement of each of claims 1, 2, 3 and 4 of said patent and in particular the amount of its damages sustained as a proximate result of defendant's manufacture, use and sale of



defendant's wall heaters models Nos. 64, 67, 68 and 69 equipped both with defendant's 4-foot economizer and with defendant's 3-foot economizer;

#### IV.

That plaintiff is entitled to an injunction as follows:

(a) That defendant, its officers, agents, servants, employees and those persons, companies or corporations in active concert or participation with them be and each of them is hereby enjoined from making or causing to be made, or offering or threatening to make, from using or causing to be used, or offering or threatening [29] to use, or selling or causing to be sold, or offering or threatening to sell, or contributing to the making, using or selling of the combination patented in and by each of claims 1, 2, 3 and 4 of the said Letters Patent No. 2,602,441 for the remainder of the term thereof;

(b) That defendant, its officers, agents, servants, employees and those persons, companies or corporations in active concert or participation with them be and each of them is hereby enjoined from making or causing to be made, or offering or threatening to make, from using or causing to be used, or offering or threatening to use, or selling, or offering, or threatening to sell, or contributing to the making, using or selling of any wall heaters of the identical construction as defendant's wall heaters models 64, 67, 68 and 69, or any wall heaters of substantially the same construction as defendant's

wall heaters models 64, 67, 68 and 69 for the remainder of the term of said Letters Patent No. 2,602,441.

Dated: February 17, 1955.

/s/ WM. C. MATHES,

United States District Judge [30]

Acknowledgment of Service attached.

[Endorsed]: Lodged February 10, 1955.

[Endorsed]: Filed February 18, 1955.

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In the United States District Court, Southern District of California, Central Division

No. 15,886-WM

HOLLY MANUFACTURING COMPANY, a corporation of California, Plaintiff,

vs.

THE COLEMAN COMPANY, INC., a corporation of Kansas, Defendant.

### INTERLOCUTORY JUDGMENT

This cause having been tried before the Court sitting without jury, and the plaintiff having been represented by its counsel James B. Christie and Richard B. Hoegh, and the defendant having been represented by its counsel Frederick W. Lyon, and the cause having been tried and submitted for decision upon the issues raised by plaintiff's complaint



and first supplemental complaint and the answers of defendant thereto, and the Court having made its findings of fact and conclusions of law, good cause appearing therefor,

It Is Hereby Ordered, Adjudged and Decreed:

1. That plaintiff owns all right, title and interest in and to Letters Patent No. 2,602,441 in suit granted July 8, 1952, to plaintiff for gas burning wall heaters, together with all rights of action for infringement thereof; [31]

2. That Letters Patent No. 2,602,441 in suit describes the invention of new and useful improvements in wall heaters fired with gaseous fuel, and is valid as to each of claims 1, 2, 3 and 4 thereof;

3. That as charged in plaintiff's complaint and first supplemental complaint, defendant intentionally has infringed the patent in suit by making, using and selling gas-burning wall heaters designated as defendant's Models Nos. 64, 67, 68 and 69 which embody the invention of the patent in suit; that said wall heaters manufactured and sold by defendant are exemplified by plaintiff's Exhibits 24 through 24e and 25 through 25d;

4. That plaintiff is entitled to damages from defendant sustained as a proximate result of defendant's infringement of any of claims 1, 2, 3 and 4 of the patent in suit, and that said damages be assessed pursuant to the provisions of 35 U.S.C. sec. 284.

5. (a) That defendant, its officers, agents, servants, employees and thos persons, companies or corporations in active concert or participation with

them be and each of them is hereby enjoined from making or causing to be made, or offering or threatening to make, or using or causing to be used, or offering or threatening to use, or selling or causing to be sold, or offering or threatening to sell, or contributing to the making, using or selling of the combination patented in and by each of claims 1, 2, 3 and 4 of the said Letters Patent No. 2,602,441 for the remainder of the term thereof;

(b) That defendant, its officers, agents, servants, employees and those persons, companies or corporations in active concert or participation with them be and each of them is hereby enjoined from making or causing to be made, or offering or threatening to make, or using or causing to be used, or offering or threatening to use, or selling, or offering, or threatening to [32] sell, or contributing to the making, using or selling of any wall heaters of the identical construction as defendant's wall heaters models 64, 67, 68 and 69, or any wall heaters of substantially the same construction as defendant's wall heaters models 64, 67, 68, 69 for the remainder of the term of said Letters Patent No. 2,602,441.

6. That this cause be and hereby is referred to Howard V. Calverley as Master pro hac vice, pursuant to Rule 53 of the Federal Rules of Civil Procedure, with directions (a) to hear and determine an accounting as to plaintiff's damages, and particularly plaintiff's damages with respect to defendant's manufacture, use and sale of defendant's wall heaters model Nos. 64, 67, 68 and 69 equipped both with the 4-foot economizer and the 3-foot

economizer, to be assessed pursuant to 35 U.S.C. sec. 284, (b) to hear all relevant evidence on the issue of damages to be assessed and (c) to report his findings of fact and conclusions of law with respect to the assessment of such damages in accordance with the provisions of 35 U.S.C. sec. 284.

7. That decision on any prayer for increased damages pursuant to the provisions of 35 U.S.C. sec. 284, or for attorney's fees, pursuant to the provisions of 35 U.S.C. sec. 285, be and is hereby reserved until after determination of plaintiff's damages.

8. That plaintiff be awarded his costs of suit in the sum of \$690.74.

Dated: February 17, 1955.

/s/ WM. C. MATHES,

United States District Judge [33]

Acknowledgment of Service attached. [34]

[Endorsed]: Lodged February 10, 1955.

[Endorsed]: Filed February 18, 1955.

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[Title of District Court and Cause.]

### NOTICE OF APPEAL

Notice Is Hereby Given that The Coleman Company, Inc., defendant above named, appeals to the United States Court of Appeals for the Ninth Cir-

cuit from the Interlocutory Judgment entered in this action on February 18, 1955.

Dated this 24th day of February, 1955.

LYON & LYON,  
/s/ By FREDERICK W. LYON,  
Attorneys for Defendant [35]

Affidavit of Service by Mail attached. [36]

[Endorsed]: Filed February 24, 1955.

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[Title of District Court and Cause.]

CONCISE STATEMENT OF POINTS ON  
APPEAL UNDER RULE (75a)

1. The Trial Court erred in holding that United States Letters Patent No. 2,602,441 described the invention of new and useful improvements in wall heaters fired with gaseous fuels and is valid as to each of claims 1, 2, 3 and 4 thereof.

2. The Trial Court erred in holding that the defendant, The Coleman Company, Inc., intentionally has infringed the patent in suit by making, using and selling gas-burning wall heaters designated as defendant's Models Nos. 64, 67, 68 and 69.

3. The Trial Court erred in holding that Models Nos. 64, 67, 68 and 69 of the defendant embodied the invention of Patent [47] No. 2,602,441.

4. The Trial Court erred in holding that any device manufactured and sold by defendant, The Coleman Company, Inc., infringed the patent in suit.

5. The Trial Court erred in holding that the plaintiff is entitled to damages from the defendant sustained as the proximate result of defendant's infringement of any of Claims 1, 2, 3 and 4 of the patent in suit and that said damages be assessed pursuant to provisions of 35 U.S.C. sec. 284.

6. The Trial Court erred in ordering the defendant, its officers, agents, servants and those persons, companies or corporations in active concert or participation with them be thereby enjoined from making or causing to be made, or offered or threatening to make, or using or causing to be used, or offered or threatening to use or sell, or cause to be sold, or offered or threatening to sell, or contributing to the making, using or selling of the combination patented in and by each of claims 1, 2, 3 and 4 of the said Letters Patent No. 2,602,441 for the remainder of the term thereof.

7. The Trial Court erred in ordering that defendant, its officers, agents, servants, employees and those persons, companies or corporations in active concert or participation with them be and each of them is hereby enjoined from making or causing to be made, or offering or threatening to make, or using or causing to be used, or offering or threatening to use, or selling, or offering, or threatening to sell, or contributing to the making, using or selling of any wall heaters of the identical construction as defendant's wall heaters models 64, 67, 68 and 69, or any wall [48] heaters of substantially the same construction as defendant's wall heaters models 64,



67, 68 and 69 for the remainder of the term of said Letters Patent No. 2,602,441.

8. The Trial Court erred in ordering that this cause be referred to a Master pro hac vice, pursuant to Rule 53 of the Federal Rules of Civil Procedure, with directions to hear and determine an accounting as to plaintiff's damages and particularly plaintiff's damages with respect to defendant's manufacture, use and sale of defendant's wall heaters Nos. 64, 67, 68 and 69 equipped both with the 4-foot economizer and the 3-foot economizer, to be assessed pursuant to 35 U.S.C. sec. 284, to hear all relevant evidence on the issue of damages to be assessed and to report his findings of fact and conclusions of law with respect to the assessment of such damages in accordance with the provisions of 35 U.S.C. sec. 284.

9. The Trial Court erred in holding that plaintiff be awarded costs of suit in the sum of \$690.74.

10. The Trial Court erred in ordering that for a long time prior to the invention of the patent in suit, the thermal input of wall heaters could not be increased substantially without excessively heating combustible walls in which the heaters were installed, and that these hot walls were encountered in both the lower and upper portions of the wall between floor and ceiling adjacent the heater; that wall heater manufacturers have no control of the height of flues attached to their heaters in buildings and that prior to the invention of the patent in suit, there was inadequate control of the amount of warm air sucked from the room into the

flue from the draft hood and thus lost, with consequent decrease in heating efficiency; that the combination of elements described and claimed [49] in the patent in this suit cooperate to permit the thermal input of wall heaters to be increased without bringing about excessive wall temperatures at any point in the wall from floor to ceiling, and without reducing thermal efficiency of the wall heaters; and that the invention of the patent in suit has simultaneously solved the hot wall problem from floor to ceiling, increased thermal efficiency while permitting increased heat input, improved air circulation within the room, minimized heat loss due to warm air being sucked out of the room into the flue through the draft hood, and has rendered this heat loss substantially independent of flue height.

11. The Trial Court erred in holding that it required the exercise of inventive faculty to invent the combination defined by each of claims 1, 2, 3 and 4 of Letters Patent No. 2,602,441 in suit.

12. The Trial Court erred in holding that the combination of elements defined by each of claims 1, 2, 3 and 4 of Letters Patent No. 2,602,441 in suit cooperate to produce a new and beneficial result unattained before the invention of said patent was made, and that the results of such combination exceed the accumulation of the results of the individual elements of such combination.

13. The Trial Court erred in holding that John H. Hollingsworth and Karl L. Bedell, who are named as the inventors in the patent in suit, are the original and first inventors of certain new and use-



ful improvements in gas-burning wall heaters as claimed in each of claims 1, 2, 3, and 4 of the patent in suit.

14. The Trial Court erred in holding that Letters Patent No. 2,602,441 in suit is valid as to each of claims 1, 2, 3 and 4 thereof. [50]

15. The Trial Court erred in holding that the disclosure contained in Letters Patent No. 2,602,441 in suit is sufficient to enable a person skilled in the art to which the patent pertains to accomplish the objects of the invention.

16. The Trial Court erred in holding that Letters Patent No. 2,602,441 in suit is not ambiguous, incomplete, or insufficient, and that the description of the invention filed in the Patent Office was not made to contain less than the whole truth relative to the alleged invention; that the description of the invention filed in the Patent Office was not made to contain more than was necessary to produce the desired results; that the description of the invention was not designed to mislead the public as to the character of the invention.

17. The Trial Court erred in holding that each of claims 1, 2, 3 and 4 of Letters Patent No. 2,602,441 in suit is supported by the specification in said patent and, construed in the light of such specification, each of such claims particularly points out and distinctly claims the parts, improvements or combination of the invention; that the inventions claimed in each of claims 1, 2, 3 and 4 of said patent is not different from any inventions indicated, sug-

gested, described or claimed in the application therefor.

18. The Trial Court erred in holding that defendant introduced in evidence 14 prior art patents (Exhibits C through P) for the purpose of showing that the invention of the patent in suit was anticipated by the prior art; that said prior art patents, taken either singly or in combination, do not describe a gas burning wall heater wherein the principle, or mode of operation, or results [51] attained are equivalent to those of the patent in suit; that said prior arts patents, taken either singly or in combination, do not describe or suggest the group of cooperative elements described and claimed by the patent in suit; that of such exhibits, Exhibits C, D, E, F and G were cited by the Patent Office in the file wrapper of the patent in suit; that neither the remainder of said exhibits (Exhibits H through P) nor any other prior art relied upon by defendant more nearly discloses the invention of the patent in suit than do the references cited by the Patent Office in the file wrapper of said patent; that none of the prior art references, taken either singly or in combination, anticipate the invention of the patent in suit.

19. That the Trial Court erred in holding that the invention of the patent in suit represents a new and useful improvement in wall heaters fired with gaseous fuel and has provided a substantial contribution to the art.

20. That the Trial Court erred in holding that the proceedings in the Patent Office had as to the

application for the patent in suit, serial No. 222,500 (defendant's Exhibit A) or the file wrapper of the abandoned application, serial No. 157,670 filed April 24, 1950, (defendant's Exhibit B), do not limit the scope of claims 1, 2, 3 and 4 of the patent in suit; that plaintiff made no admissions in either of said file wrappers which would restrict or limit the scope of claims 1, 2, 3 and 4.

21. The Trial Court erred in holding that defendant's wall heaters models No. 64, 67, 68 and 69 equipped with defendant's 4-foot economizer, exemplified by Exhibits 24 through 24E, contain all the elements of each of claims 1, 2, 3 and 4 of Letters Patent No. 2,602,441 in suit. [52]

22. The Trial Court erred in holding that defendant's wall heaters models 64, 67, 68 and 69 equipped with defendant's 3-foot economizer, exemplified by Exhibits 25 through 25d, contain all the elements of each of claims 1, 2, 3 and 4 of the patent in suit.

23. The Trial Court erred in holding that defendant undertook the manufacture and sale of its wall heaters models Nos. 64, 67, 68 and 69 after defendant's New Products Committee and its design engineers had seen an exemplar of plaintiff's device which embodied the inventions of the patent in suit.

24. The Trial Court erred in holding that defendant's wall heaters models Nos. 64, 67, 68 and 69 manufactured and sold by defendant prior to November 2, 1953, employed defendant's 4-foot economizer which was adapted to receive air flowing up-

ward outside the first box and inside the wall as taught and claimed by the patent in suit.

25. The Trial Court erred in holding that after the plaintiff had sent notice of infringement of the patent in suit to the defendant represented to the plaintiff that defendant was redesigning defendant's wall heaters models Nos. 64, 67, 68 and 69 to prevent the flow of air upward into the second box or economizer from the conduit provided outside the first box and inside the wall, but that defendant's redesigned wall heaters models Nos. 64, 67, 68 and 69 which were manufactured and sold by the defendant on or after November 2, 1953, and which employed defendant's 3-foot economizer did not prevent such flow of air.

26. The Trial Court erred in holding that defendant's wall [53] heaters models Nos. 64, 67, 68 and 69 manufactured and sold by defendant on or after November 2, 1953, employed defendant's so-called 3-foot economizer which was adapted to receive air flowing upward outside the first box and inside the wall as taught and claimed by the patent in suit.

27. The Trial Court erred in holding that the upper radiator in all defendant's wall heaters models Nos. 64, 67, 68 and 69 is made substantially smaller in horizontal cross section than the first radiator in such heaters in order to minimize loss of efficiency of the heater when warm air is drawn from the room through the draft hood to dilute the combustion products in the upper radiator.

28. The Trial Court erred in holding that all of



defendant's wall heaters models No. 64, 67, 68 and 69 infringe each of claims 1, 2, 3 and 4 of Letters Patent No. 2,602,441 in suit.

29. The Trial Court erred in holding that the inlet grilles on the defendant's devices, designated as grilles 7 and 8 on Exhibit 24a, contribute some air to the flow of air through defendant's economizers, exemplified by Exhibits 24b and 25a; that at best, such grilles function merely as an addition to the structure and do not avoid infringement.

30. The Trial Court erred in holding that defendant's infringement of claims 1, 2, 3 and 4 of the patent in suit has been and is intentional, conscious and deliberate and that defendant threatens to continue to infringe said claims and will infringe said claims unless enjoined by this court.

31. The Trial Court erred in holding that all plaintiff's wall [54] heaters exemplified by Exhibits 20 through 20d and Exhibit 44 embody the inventions claimed in the patent in suit.

32. The Trial Court erred in holding that plaintiff's manufacture and sale of wall heaters exemplified by Exhibits 20 through 20d and Exhibit 44 has been commercially successful, and that defendant has had substantial commercial success in the manufacture and sale of its wall heaters models Nos. 64, 67, 68 and 69.

33. The Trial Court erred in holding that plaintiff has committed no acts which prevent it from seeking or obtaining relief in a court of equity for infringement of the patent in suit.

34. The Trial Court erred in holding that plain-

tiff is entitled to damages sustained as a proximate result of defendant's infringement of each of claims 1, 2, 3 and 4 of the Letters Patent No. 2,602,441 in suit, to be assessed pursuant to the provisions of 35 U.S.C. sec. 284.

35. The Trial Court erred in holding that plaintiff is entitled to an accounting to ascertain pursuant to the provisions of 35 U.S.C. sec. 284 the amount of its damages sustained as a proximate result of defendant's infringement of each of claims 1, 2, 3 and 4 of said patent and in particular the amount of its damages sustained as a proximate result of defendant's manufacture, use and sale of defendant's wall heaters models Nos. 64, 67, 68 and 69 equipped both with defendant's 4-foot economizer and with defendant's 3-foot economizer.

36. The Trial Court erred in holding that plaintiff is entitled to an injunction as follows:

(a) That defendant, its officers, agents, servants, [55] employees and those persons, companies or corporations in active concert or participation with them be and each of them is hereby enjoined from making or causing to be made, or offering or threatening to make, from using or causing to be used, or offering or threatening to use, or selling or causing to be sold, or offering or threatening to sell, or contributing to the making, using or selling of the combination patented in and by each of claims 1, 2, 3 and 4 of the said Letters Patent No. 2,602,441 for the remainder of the term thereof;

(b) That defendant, its officers, agents, servants, employees and those persons, companies or corpora-

tions in active concert or participation with them be and each of them is hereby enjoined from making or causing to be made, or offering or threatening to make, from using or causing to be used, or offering or threatening to use, or selling, or offering, or threatening to sell, or contributing to the making, using or selling of any wall heaters of the identical construction as defendant's wall heaters models 64, 67, 68 and 69, or any wall heaters of substantially the same construction as defendant's wall heaters models 64, 67, 68 and 69 for the remainder of the term of said Letters Patent No. 2,602,441.

37. The Trial Court erred in not holding that the prior art patent to McLeod, No. 1,361,389 of 1920, anticipated and showed lack of invention of the patent in suit.

38. The Trial Court erred in not holding that the prior art patent to Wright, No. 2,453,954 of 1948, anticipated and showed lack of invention of the patent in suit.

39. The Trial Court erred in not holding that the prior art patent to Marble, No. 2,484,457 of 1949, anticipated and showed [56] lack of invention of the patent in suit.

40. The Trial Court erred in not holding that the defendant's heaters Nos. 64, 67, 68 and 69 were constructed in accordance with the teachings of the prior patent to Browell, No. 268,860 in 1882.

41. The Trial Court erred in not holding that the defendant's heaters Nos. 64, 67, 68 and 69 were constructed in accordance with the teachings of the prior patent to Snyder, No. 2,093,492 in 1937.



42. The Trial Court erred in not holding that the defendant's heaters Nos. 64, 67, 68 and 69 were constructed in accordance with the teachings of the prior patent to Hamilton, No. 311,313 in 1885.

43. The Trial Court erred in not holding that the Metalbestos construction exemplified in Exhibit T anticipated and showed lack of invention in the patent in suit.

44. The Trial Court erred in making no findings of fact as to what was new in the alleged combination of the patent in suit.

45. The Trial Court erred in not determining the difference between the combination of the patent in suit and those combinations disclosed in the prior art.

46. The Trial Court erred in not dismissing plaintiff's complaint.

47. The Trial Court erred in not dismissing plaintiff's [57] combined original and supplemental complaints.

48. The Trial Court erred in not granting defendant its necessary costs and disbursements.

Dated this 14th day of March, 1955.

LYON & LYON,

/s/ By FREDERICK W. LYON,

Attorneys for Defendant-Appellant

[Endorsed]: Filed March 14, 1955.

[Title of District Court and Cause.]

## CERTIFICATE OF CLERK

I, Edmund L. Smith, Clerk of the United States District Court for the Southern District of California, do hereby certify that the foregoing pages numbered 1 to 61 inclusive, contain the original

Complaint;

Answer;

First Supplemental Complaint;

Answer to First Supplemental Complaint;

Order for Findings of Fact, Conclusions of Law and Interlocutory Judgment;

Findings of Fact and Conclusions of Law;

Interlocutory Judgment;

Notice of Appeal;

Bond on Stay of Injunction;

Defendant-Appellant's Designation of Portions of Record on Appeal Pursuant to Rule 75;

Concise Statement of Points on Appeal under Rule (75a);

Plaintiff's Designation of Additional Portions of Record on Appeal; which, together with six volumes of Reporter's Transcript of Proceedings on trial; and the original Plaintiff's Exhibits 1 to 8 inc., 10 to 47 inc.; and the original Defendant's Exhibits A, B, C, Q to Z inc., AA to AR inc.; all in said cause, constitute the transcript of record on appeal to the United States Court of Appeals for the Ninth Circuit.

I further certify that my fees for preparing and

certifying the foregoing record amount to \$2.00, which sum has been paid by appellants.

Witness my hand and the seal of said District Court, this 1 day of April, 1955.

[Seal]

EDMUND L. SMITH,  
Clerk

/s/ By THEODORE HOCKE,  
Chief Deputy

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In the United States District Court, Southern District of California, Central Division

No. 15886-WM

HOLLY MANUFACTURING COMPANY, a corporation of California, Plaintiff,

vs.

THE COLEMAN COMPANY, INC., a corporation of Kansas, Defendant.

### TRANSCRIPT OF PROCEEDINGS

Los Angeles, Calif., Tuesday, Jan. 11, 1955

Honorable William C. Mathes, Judge presiding.

Appearances: For the Plaintiff, James B. Christie, and Richard B. Hoegh, 595 East Colorado St., Pasadena, Calif. For the Defendant: Lyon & Lyon, by Frederick W. Lyon, 811 W. Seventh St., Los Angeles, Calif. \* \* \* \* \* [1\*]

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\* Page numbers appearing at top of page of original Reporter's Transcript of Record.

The Court: Very well.

The soft copy here will be substituted as Plaintiff's Exhibit 1 in evidence. That is the patent in suit, is it?

Mr. Christie: That is correct. [13]

The Court: The clerk will return the original.

The Clerk: Is this admitted in evidence, your Honor?

The Court: In evidence.

(The document referred to was marked Plaintiff's Exhibit 1, and was received in evidence.)

[See Book of Exhibits.]

Mr. Christie: As Plaintiff's Exhibit 2, I would like to offer the assignment from John H. Hollingsworth and Karl Bedell to the Holly Manufacturing Company. I have shown the original to Mr. Lyon and he has no objection to putting into evidence as Plaintiff's Exhibit 2 a photostat of that assignment.

Mr. Lyon: No objection, your Honor.

The Court: It is stipulated the document is genuine and in all respects what it purports to be, and it was executed on or about the date it bears?

Mr. Lyon: Yes, your Honor, I believe this document is genuine. If I could prove differently I would like an exception to it, but I can't, so——

The Court: Very well, the assignment is received in evidence as Plaintiff's Exhibit 2.

(The document referred to was marked Plaintiff's Exhibit 2, and was received in evidence.)

Mr. Christie: As Plaintiff's Exhibit 3 I would like to offer in evidence a certified abstract of title

of the patent by the Patent Office of the Department of Commerce of the [14] United States.

Again, I have shown the original to Mr. Lyon and I believe that he has no objection to marking a photostatic copy in evidence.

Mr. Lyon: No objection to the copy or the offer.

The Court: It is stipulated the document is genuine and in all respects what it purports to be?

Mr. Lyon: Yes, your Honor.

The Court: The abstract, a copy will be received in evidence as Plaintiff's Exhibit 3.

(The document referred to was marked Plaintiff's Exhibit 3, and was received in evidence.)

Mr. Christie: I would like to call your Honor's attention to the fact that defendant on page 2 of the pretrial statement has stipulated, paragraph 2, that plaintiff is the owner of the United States Letters Patent No. 2,602,441, which is the patent in suit.

\* \* \* \* \* [15]

The Court: Very well. The Request for Admissions will be Plaintiff's Exhibit 17. Is that right, Mr. Clerk? [18]

The Clerk: Yes, your Honor.

The Court: It will be received in evidence.

(The document referred to was received in evidence and marked as Plaintiff's Exhibit No. 17.)

The Court: Now, do you offer Defendant's Admissions and Denials in Response to Plaintiff's Request for Admissions?

Mr. Hoegh: Yes, your Honor.

The Court: Any objection?

Mr. Lyon: No objection, your Honor.

The Court: They will be received. That was a document filed December 17, 1954. It will be received as Plaintiff's Exhibit 18 in evidence.

(The document referred to was received in evidence and marked as Plaintiff's Exhibit No. 18.)

[See page 519.]

\* \* \* \* \* [19]

Mr. Lyon: I want to check the numbers.

As Exhibit S I will offer the entire stipulation and pretrial statement.

The Court: Is there any objection?

If there is no objection the pretrial statement entitled "Pretrial Statement," which appears to be a pretrial stipulation, is received in evidence as Defendant's Exhibit S.

(The document referred to was marked Defendant's Exhibit S, and was received in evidence.)

[See page 622.]

\* \* \* \* \* [29]

Mr. Hoegh: We will offer it now, your Honor, as Plaintiff's Exhibit 19.

The Court: Is there objection?

Mr. Lyon: I would like to know just what is offered. I didn't quite follow it.

The Court: Stipulation and order signed today with respect to interrogatories 5 and 6.

Mr. Lyon: I have no objection. [33]

The Court: Received in evidence as Plaintiff's



Exhibit 19. It hasn't been filed yet, Mr. Clerk, this last-mentioned document.

Mr. Lyon: It needed the court's approval, your Honor. That is why it hadn't been filed.

The Court: I signed an order on it at the opening this morning.

(The document referred to was marked Plaintiff's Exhibit 19, and was received in evidence.)

[See page 525.]

\* \* \* \* \* [34]

JOHN H. HOLLINGSWORTH,  
called as a witness by and on behalf of the plaintiff, having been first duly sworn, was examined and testified as follows:

The Clerk: State your name, please.

The Witness: John H. Hollingsworth.

#### Direct Examination

Q. (By Mr. Christie): Give your full name, age, residence, and occupation.

A. My name is John H. Hollingsworth, I am 37 years of age, I am a development engineer, I reside at 1976 North Roosevelt Avenue, Altadena, California.

Q. Are you the John H. Hollingsworth named as one of the co-inventors in the patent in suit, No. 2,602,441?

A. Yes, I am.

Q. Who is your employer, Mr. Hollingsworth?

A. The Holly Manufacturing Company in Pasadena.

Q. How long have you been employed by Holly?

(Testimony of John H. Hollingsworth.)

A. Nearly nine years.

Q. Will you tell me what you have done in the course of your employment with Holly?

A. During the entire time that I have been with the Holly Manufacturing Company I have been product development engineer. I have been responsible for the design of new products and the further development of existing products.

Q. What industrial experience did you have, if any, before you came to Holly?

A. During the war I worked for Douglas Aircraft Company as a design engineer. My work was concerned with heating and ventilating and air conditioning of aircraft.

After leaving Douglas I worked for the Rheem Manufacturing Company in their research laboratories on reverse cycling air conditioning projects.

Q. What has been your education?

A. I have a Bachelor's degree in petroleum engineering from the University of Southern California.

Q. When did you get that?

A. 1942.

Q. Are you a member of any industrial groups connected with gas heating appliances?

A. Yes, I am. I am associated with the American Gas Association through industry committees. Also with the Gas Appliance Manufacturers Association.

Q. Is the American Gas Association sometimes called the A.G.A.?

A. That is correct.

(Testimony of John H. Hollingsworth.)

Q. Will you describe what the A.G.A. is and what it does?

A. The A.G.A. is a national association supported by [39] and working for the gas industry. It performs many of the functions that you would ordinarily expect of an industry association. It is very active. Probably the most important function with which we might be concerned has to do with the A.G.A. testing laboratories.

This is a nationally recognized testing agency which certifies the approval of gas appliances as to their compliance with minimum standards which have been established by the industry for safety and performance and durability.

The A.G.A. seal of approval, which is granted to those appliances that successfully meet these minimum test standards, are quite well recognized nationally by the Federal Government and by local governments, and by codes and ordinances authorities to the extent that it would be virtually impossible for a manufacturer of gas appliances to manufacture and sell successfully an appliance without first having obtained the seal of approval by successfully complying with the tests.

So that as a design engineer I must look to the test standards, requirements established by the American Gas Association as my basic design specifications for any gas appliance that I might develop.

Q. What connection have you individually had with the A.G.A., if any?

A. I am vice-chairman of the Approval Re-

(Testimony of John H. Hollingsworth.)

quirements [40] Panel for Vented Recessed Heaters, which is the formal identification for the wall heaters that we are discussing at this time.

That committee lays most of the groundwork for revisions in existing requirements and development of new requirements, approval requirements relating to vented recessed heaters.

I am also a member of the Technical Advisory Group for Heating and Air-conditioning Research, which is attached to the American Gas Association. That committee acts in an advisory capacity in the development of factual research information for the industry. Items, projects, such as basic heat transfer work, or more specifically a particular project for which I am technical advisor, is one that relates to the problems connected with venting appliances, such as these under discussion here today.

Q. You mentioned the Gas Appliance Manufacturers Association; will you describe what this association is?

A. As the name implies, it is a national association of gas appliance manufacturers. It works and is associated very closely with the American Gas Association, but is a more specific association in that it includes only gas appliance manufacturer members, whereas the American Gas Association also includes utility members.

Q. Is this organization sometimes known as GAMA?      A. Correct. [41]

Q. What is your personal connection with GAMA, if any?

(Testimony of John H. Hollingsworth.)

A. I am chairman of the Codes and Ordinances Committee of the floor and wall furnace division of GAMA.

Mr. Christie: Your Honor, I am about to ask Mr. Hollingsworth to discuss a plaintiff's heater, which we say is constructed in accordance with the patent in suit. Would it be convenient to have him step down and identify the several parts for you, or do you want him to remain on the stand?

The Court: I think it would be convenient to have him step down and take the device and identify the various parts.

Has the plaintiff's device been given an exhibit number?

Mr. Christie: I am about to offer it, sir, for identification.

The Court: What exhibit number is this device now?

Mr. Christie: This will be Plaintiff's Exhibit No. 20, your Honor. That does not have an exhibit number.

The Court: Exhibit 20 for identification.

Mr. Lyon: What part is 20?

Mr. Christie: The entire exhibit.

Mr. Lyon: I think we had better number the parts separately.

The Court: The large device there, I suppose that is the hull of the heater, or the shell of it? [42]

Mr. Christie: That is the lower box, sir.

The Court: That will be Exhibit 20 for identification.



(Testimony of John H. Hollingsworth.)

(The device referred to was marked Plaintiff's Exhibit 20, for identification.)

The Court: And what other pieces are there?

Mr. Lyon: What they call their secondary heater. Let's call that 20-B.

The Court: 20-A, would it not be?

Mr. Lyon: 20-A.

(The device referred to was marked Plaintiff's Exhibit 20-A, for identification.)

The Court: What next?

The Witness: Possibly the panel.

Mr. Christie: The panel which appears on the front of the first or large one should be 20-B.

Mr. Lyon: Where is that?

Mr. Christie: This right here (indicating).

Mr. Lyon: Is that removable now?

Mr. Christie: That is removable now.

The Court: You call it a panel?

Mr. Christie: We call it a panel, sir.

The Court: It will be Exhibit 20-B for identification.

(The device referred to was marked Plaintiff's Exhibit 20-B, for identification.)

The Court: And is there another piece there?

Mr. Christie: There is a top grille on the panel which we will refer to as Plaintiff's Exhibit 20-C, for identification.

The Court: It will be so marked.

(The article referred to was marked Plaintiff's Exhibit 20-C, for identification.)

Mr. Christie: And an upper grille which be-



(Testimony of John H. Hollingsworth.)

longs with the secondary heat exchanger or upper box, which we would like to have marked as 20-D for identification.

The Court: It will be so marked.

(The article referred to was marked Plaintiff's Exhibit 20-D, for identification.)

Mr. Lyon: We have no objection to Exhibits 20 through 20-D going into evidence as exemplars of a machine manufactured by plaintiff.

The Court: It is so stipulated?

Mr. Christie: So stipulated.

The Court: Very well, Exhibits 20, 20-A, 20-B, 20-C and 20-D, for identification, are received in evidence pursuant to stipulation.

(The exhibits referred to, marked Plaintiff's Exhibits 20, 20-A, 20-B, 20-C, and 20-D, for identification, were received in evidence.)

Mr. Christie: For the convenience of the witness I wonder if we might have tags actually placed on the exhibits [44] so that he knows which ones he is talking about.

The Court: The clerk will mark them.

Exhibit 20, what do you call it, again? I didn't get it in my notes.

Mr. Christie: This is the primary heat exchanger, your Honor, or the lower box with the lower radiator.

20-A, we call the secondary heat exchanger, or the upper box, and the upper radiator.

The Court: Is there a radiator there?

(Testimony of John H. Hollingsworth.)

Mr. Christie: Yes, this pipe radiates heat.

The Court: But there is no heating unit as such? There is a heating unit in the lower box?

Mr. Christie: There is a burner in the lower box, that is correct. There is no burner in the upper box.

The Court: I suppose strictly speaking anything that radiates heat would be correctly called a radiator, would it, Mr. Hollingsworth?

Mr. Hollingsworth: That is trade terminology, your Honor. [45]

The Court: And the portion of the device that actually supplies the heat would be called the burner? The Witness: Correct.

Q. (By Mr. Christie): Mr. Hollingsworth, do you recognize this as a device manufactured by the Holly Manufacturing Company? A. Yes, sir.

Q. Will you explain to the court what the several elements of the device are and how it is put together?

A. Yes. This first box, which has the first radiator which includes a combustion zone and the burner——

The Court: That is Exhibit 20.

The Witness: ——mounts in the wall between studs in a standard partition. It is recessed in the wall but projects out slightly past the plaster face of the wall. Above that mounted in the wall is this Exhibit 20-A, I believe, which is the secondary heat exchanger. That has a second radiator mounted in a jacket forming an annulus between the second

(Testimony of John H. Hollingsworth.)

radiator and the jacket walls. That is open on the bottom. It is closed on the top. That is, the annulus is closed. The radiator is open; adapted to receive a flue pipe for discharge of flue products out of the second radiator through the flue pipe.

The Court: The flue pipe would go through the roof, would it? [46]

The Witness: Correct. This is a plaster seal. I might mention, this is normally mounted in what we call in construction, which is before the walls are plastered, and located in place. And then the walls are plastered after this is in position. This is the only part of the appliance that goes in on the rough.

The Court: Now, you are referring to Exhibit 20-A?

The Witness: To Exhibit 20-A.

Mr. Christie: Would you refer, if you can, Mr. Hollingsworth, to the exhibit number, so that the record will be plain?

The Witness: Exhibit 20-A then has the annulus opening at the bottom that I just described, and a discharge opening higher up on the box side, which provides means for discharging air that would enter into the annulus.

The Court: That aperture there is to discharge air into the room, is it?

The Witness: Yes, your Honor. And that is located near the ceiling.

The Court: That would be about half way up Exhibit 20-A, is that it?

(Testimony of John H. Hollingsworth.)

The Witness: Correct.

The Court: Now, does that annulus fit over a like annulus at the top of Exhibit 20 and thus, in effect, form a flue pipe? [47]

The Witness: If I might, your Honor, first—if I could describe Exhibit 20, then I think I might be able to demonstrate that.

Exhibit 20 has a box which we refer to in the patent as the first box. It has mounted in that first box a first radiator. It has a burner mounted in the bottom of the first radiator. Gases are burned together with air in the bottom of the first radiator. The bottom of the first radiator can open to receive air for combustion. The combustion process takes place in the lower portion of the first radiator. The flue products then move up through the first radiator and are discharged through these tubes into what we term the draft hood, which is a part of Exhibit 20. They then are discharged into this outlet collar—that is, the flue products are discharged into this outlet collar, which is adapted to receive the radiator of Exhibit 20-A, the lower portion——

The Court: Which you referred to as the annulus—not the annulus, but the radiator itself.

The Witness: The radiator itself.

The Court: I am sorry.

The Witness: So that this then is approximately in that position as it is mounted in the wall (indicating).

This portion of the upper box, Exhibit 20-A, is normally referred to as a header plate and it pro-

(Testimony of John H. Hollingsworth.)

vides support for the second box to the studs, and also forms a seal, a fire stop [48] if you please, to effectively seal off the lower box from the stud space that is enclosing the second box, or Exhibit 20-A.

The Court: What you have just described, in effect, constitutes a base for Exhibit 20-A, is that it?

The Witness: Correct. Air movement through the heater is generally in this manner:

Well, first, I might go back to the panel which—what is the number of that exhibit?

The Court: The panel I believe is Exhibit 20-B.

The Witness: 20-B then. This panel mounts then over the face of the lower box, Exhibit 20, flush with the wall. It provides a finish trim which is of pleasing appearance. It provides, also, an aperture at the base of the panel whereby air may enter in the bottom into the first box and around the first box.

Mr. Christie: Does this air come in from the floor level?

The Witness: Yes.

The Court: And from the room itself?

The Witness: And from the room itself. This is adapted to be mounted approximately three inches off the floor to provide an opening at the base of the panel to allow the air that is circulated through the heater to be drawn from the floor level, which is the preferable place for drawing the air. The air then circulates, a portion of it, up through and [49] around—pardon me. Up around the first radiator,



(Testimony of John H. Hollingsworth.)

which provides heat transfer; it is discharged from this grille——

Mr. Christie: What is the exhibit number on the grille?

The Court: Is that the upper grille or just what is called the grille?

The Witness: The upper grille, yes.

Mr. Christie: 20-C.

Mr. Lyon: That is the lower grille. This is the upper grille here (indicating).

The Court: The smaller grille is the upper grille, is it not?

The Witness: If you want to term it that way.

The Court: I believe that is the way it is identified.

The Witness: Then this would be the lower grille (indicating).

The Court: Exhibit 20-B.

Mr. Christie: 20-C.

The Court: 20-C. I am sorry.

The Witness: The lower grille then is 20-C.

The Court: Exhibit 20-C.

The Witness: The air moves up then around the first radiator, conducting the heat from the first radiator, and then is discharged out through the lower portion of the grille, 20-C.

Air also moves around the back of the box, between the [50] box and the wall. Provisions are supplied on the back of the box and on the sides of the box to space the box from the studs on the



(Testimony of John H. Hollingsworth.)

side and wallboard on the back to provide the conduit of the sides and back of the box.

The Court: What is the source of that air?

The Witness: The source of that air is also from the floor level at the same instant location.

The Court: And from the room?

The Witness: And from the room, yes, sir. That air then moves up around the back of the box, being heated. It comes over the top of the box and enters the annulus of the secondary heat exchanger.

The Court: Exhibit?

The Witness: Exhibit 20-A. And it travels up through that annulus, being further heated because it is in contact with the second radiator, Exhibit 20-A; and then discharges from the upper grille, which covers the discharge outlet halfway up Exhibit 20-A.

Mr. Christie: You show the court how the upper grille goes on the secondary heat exchanger.

The Witness: That upper grille—being 20-D, I assume—that upper grille is attached with these screws in this fashion (indicating).

This collar or projection on Exhibit 20-A is what we term the secondary heat exchanger plaster ground. [51] This unit, being mounted in the wall before the wall covering is put in position, we must provide some means for indexing the opening to the plaster. This upper grille then provides the finish trim and cover for this aperture.

The Court: That aperture you just referred to

(Testimony of John H. Hollingsworth.)

normally would be very near the ceiling of the room?

The Witness: Normally it will be on the order of eight or ten inches below the ceiling; sufficiently below the ceiling in normal installations to reduce any tendency to discolor the ceiling by air moving across the ceiling.

The Court: That air is forced downward into the room? Is that the design?

The Witness: The air tends to be forced downward in to the room because the grille louvres are turned downward. The air discharged from this lower grille is substantially warmer than that discharged from the upper grille.

The Court: That warm heat rises? The warm air rises?

The Witness: Yes, sir, that is correct.

The Court: Well, would the air that comes out the upper grille, does it, being cooler, tend to fall into the room?

The Witness: We contend, sir, that it helps to create better conditions within the living space because it blends with the warmer air that is discharging out the lower grille, and as it rises, tends to make a more uniform temperature [52] condition toward the ceiling.

The Court: All right.

Q. (By Mr. Christie): Mr. Hollingsworth, I show you a large diagram——

Mr. Christie: I would like to have the clerk

(Testimony of John H. Hollingsworth.)

mark this for the purposes of identification as Plaintiff's Exhibit 21.

The Court: It may be so marked.

(The exhibit referred to was marked Plaintiff's Exhibit No. 21 for identification.)

Q. (By Mr. Christie): I call your attention to the diagram on the left-hand side of the page and ask you if you will explain what that diagram shows.

A. This diagram is a cross-section——

Mr. Christie: I think if you could show it to his Honor, it would be advantageous.

The Witness: This diagram is a cross-section of the heater that we have just been discussing, our Holly No. 35 wall heater. It shows the heater mounted in a wall, and also has colored arrows depicting the air movement and gas movement through the appliance.

The Court: The blue arrows represent the air, is that it; and the red arrows represent the gas?

The Witness: The only arrows that represent gas would be the red arrows.

I am speaking of gas in the terms of gas that we would [53] burn in the appliance; air being a gas—differentiating from it in this respect. The red arrows would indicate the flow of the gas-air mixtures, products of combustion from the burner which is depicted by this cross-section. Those flue products travel upward then through the first radiator, through the tubes, through the draft hood——

(Testimony of John H. Hollingsworth.)

Mr. Christie: Perhaps it would be better for the record, Mr. Hollingsworth, if you would identify on the drawing, mark the drawing with the same exhibit numbers that you have used in connection with the physical exhibits.

The Witness: All right. This would be the panel which——

Mr. Christie: I believe it is 20-B.

The Clerk: 20-B, the panel.

The Court: You are drawing lead lines and putting that designation?

The Witness: Yes.

Mr. Lyon: Is that in black pencil that he is doing that?

The Witness: In ink.

The second arrow would point out the first box assembly. I believe it is Exhibit 20.

This arrow would denote the lower grille, Exhibit——

Mr. Christie: 20-C, I believe.

The Clerk: 20-C, the lower grille.

The Witness: ——20-C. (Indicating.) [54]

This arrow would depict the location of the secondary heat exchanger, Exhibit 20-A, I believe.

The Clerk: 20-A.

The Witness: 20-A.

This arrow would depict the upper grille, 20-D (indicating).

The Court: Each time you have placed an arrow—each time you have mentioned “this arrow,” you have drawn an arrow?

(Testimony of John H. Hollingsworth.)

The Witness: I have drawn an arrow leading to the exhibit that I am pointing out.

The Court: You have drawn it on Exhibit 21 for identification, and you have placed the verbal designation and the exhibit number which you have stated in your testimony in each instance?

The Witness: Yes.

Q. (By Mr. Christie): Mr. Hollingsworth, with reference to the diagram that you have just investigated, will you tell me whether or not the device that it illustrates contains a first box adapted to be mounted in a wall of a room to extend upward therein from a level near the floor of the room to a level part way to the ceiling? And, if so, will you mark that with a legend?

Mr. Lyon: Your Honor, that is objected to. Counsel is now trying to have this man interpret the claims of the patent in suit. I think that is the province of this court and [55] a thing for it to decide.

The Court: Is it in issue whether or not these various——

Mr. Christie: It is merely for purposes of identification, if your Honor please.

The Court: Just a moment. Is it in issue here that Exhibits 20, 20-A, 20-B, 20-C and 20-D, assembled together, are manufactured in accordance with the claims of the patent?

Mr. Lyon: It definitely is, sir. I do not admit that. And I have good reasons for it.

The Court: Well, it would be a matter of argument. I will hear the expert. But his testimony with



(Testimony of John H. Hollingsworth.)

respect to conclusions, that would be the same——

Mr. Christie: I will ask it then as——

Mr. Lyon: I will object further on the ground it was a leading question.

The Court: Well, on that latter ground, overruled.

Mr. Christie: Do you want me to rephrase the question, your Honor?

The Court: I don't believe it will save us time to go into that. You could make the same argument—unless you think that it's a technical matter that Mr. Hollingsworth can explain better than you can.

Mr. Christie: Your Honor, my whole purpose in going through this is to explain through Mr. Hollingsworth, who is completely familiar with the heater, because he invented it, [56] how it is put together and how it works.

The Court: Well, he may say that. But when you read portions of the claims of the patent in suit to him and ask him whether or not the device, plaintiff's device is that, and he expresses a conclusion which the court is called upon to make——

Mr. Christie: Mr. Hollingsworth, will you go through that diagram and mark on it, and explain to the court if you will, each element which it contains, including the physical structure in which the furnace is mounted?

The Court: Well, that is something he could mark during the recess, isn't it?

Mr. Christie: I thought, your Honor, if you



(Testimony of John H. Hollingsworth.)

could actually see it as he did it, it might be educational.

The Court: Very well. Proceed, Mr. Hollingsworth. You don't need to make any statement with respect to it. You merely want him, without saying anything at this time, to mark it, is that correct?

Mr. Christie: I should like to have him say what it is he is marking so the record will show it, too.

The Court: Very well. You may mark on Exhibit 21 for identification, Mr. Hollingsworth, and you may describe what you are doing at the time or after you have completed it.

The Witness: I would first mark the wall structure that the heater is mounted in, denoting it with an arrow pointing [57] to it, and it will have designation "A."

I would secondly point to——

The Court: As long as you have plenty of room, wouldn't it be helpful to have you write "wall structure" there instead of "A"?

The Witness: All right. Instead of "A," I will change that to "wall structure."

Referring to the first box assembly, Exhibit 20, I would mark the first radiator within the box; I would mark the baffle between the shell of the first box and the wall.

The Court: What is a baffle, precisely?

The Witness: A baffle is a heat shield, in its function.

The Court: A piece of metal?

The Witness: A piece of metal which protects

(Testimony of John H. Hollingsworth.)

the radiant temperature—protects the wall from the radiant temperatures and provides an air space between its surface and adjacent surfaces.

Mr. Christie: Would you mark that air passage?

The Witness: Yes, sir.

The Court: Would it be correct to say that a baffle is a metal insulator?

The Witness: Yes, sir. I will then mark the draft hood, which is the device that I described on Exhibit 20 as being between the first radiator and the second radiator (indicating). [58]

Then mark the second radiator, the second box, which is the jacket around the second radiator.

Mark the burner, which is the means provided for burning fuel.

I would mark the air passage between the second radiator and the second box.

I think I would mark, also, what the colors of the arrows might depict to describe the movement through the appliance.

The blue arrows depict air moving upward around—rather than around, between the first box and the wall, and the air moving through the secondary heat exchanger annulus, and out the upper grille.

Q. (By Mr. Christie): Point out the course of those blue arrows to the judge, Mr. Hollingsworth.

A. Yes. The blue arrows start here (indicating)——

The Court: The bottom of the drawing?

The Witness: Yes, at the bottom of the drawing, depicting air that has been drawn in at the

(Testimony of John H. Hollingsworth.)

base of the appliance, but from within the room, upward around the first box between the first box and the wall, up to the top of the first box and into the annulus of the second radiator, through the opening—excuse me—into the annulus of the secondary heat exchanger, through the opening provided at the base of the secondary heat exchanger, upward through that annulus and out of the upper grille into the room. [59]

The red arrows show the gas-air mixture burned in the first radiator moving up through the first radiator into and through the draft hood and second radiator.

The Court: The gas as indicated by the red arrows is ultimately conducted through the flue?

The Witness: Yes. I would add, as a continuation of that, through the draft hood and second radiator and into the flue.

The yellow arrows would depict the air movement—circulating warm air movement, would be better, around the first radiator and in the first box, discharged into the room through the lower grille.

The Court: And the red arrow goes out the flue?

The Witness: Correct.

The Court: The yellow arrow is heated and ejected into the room through the lower grille, and the blue arrow air is ejected into the room through the upper grille, is that it?

The Witness: Correct. In a sense they are all continuously recirculated within the room, because both the air depicted by the yellow arrows and the

(Testimony of John H. Hollingsworth.)

air depicted by the blue arrows are drawn from near the floor level within the room and discharged up higher in the room and recirculated in that manner.

Q. (By Mr. Christie): Mr. Hollingsworth, was this drawing that you just testified to, Plaintiff's Exhibit 21, [60] prepared under your direction or control? A. Yes, it was.

The Court: Exhibit 21?

Mr. Christie: Right.

What would you say with respect to the scale of the drawing?

The Witness: The scale is within the normal accuracy of layout work as done by a layout draftsman. The scale is quite accurate.

Q. (By Mr. Christie): What is the scale?

A. The scale is one-quarter to one.

Q. So that the actual installation, if we took the physical exhibits, would be four times as tall as the drawing, is that correct?

A. Correct.

Q. Mr. Hollingsworth, have you investigated the horizontal cross-section of the lower radiator and the upper radiator in the Holly furnace?

A. Yes, I have.

Q. Will you explain what you did?

A. I did two things. I calculated the cross-sectional area of the second radiator, and it being uniform in cross-section I considered that accurate. I calculated the average cross-section of the lower

(Testimony of John H. Hollingsworth.)

radiator. That not being uniform, I could not consider as being other than approximate. [61]

Further than that, I had under my direction—I had the first radiator filled with water up to the point of the tubes that discharge into the draft hood, which were sealed with wax, and by calculating from the weight and volume of the water and the height of the radiator I accurately determined or had accurately determined the cross-sectional area of the first radiator.

The Court: By the first radiator you mean Exhibit 20?

The Witness: Exhibit 20.

The Court: And by the second radiator you mean Exhibit 20-A?

The Witness: Well, it is a part of Exhibit 20-A.

The Court: Yes, but when you refer to that object you are referring to the object which is marked here as——

The Witness: As Exhibit 20-A.

Mr. Christie: To avoid confusion, your Honor, the radiator is only part of 20—the lower radiator is only part of 20, it is inside 20 as a whole. And the radiator in 20-A is also only part of the whole. It is the inside part.

Is that correct, Mr. Hollingsworth?

The Witness: That is correct.

Mr. Christie: I didn't mean to testify.

Mr. Hollingsworth, I hand you a single sheet here and ask you to identify it and tell me what it is.



(Testimony of John H. Hollingsworth.)

I would like to have it marked as Plaintiff's Exhibit 21 for identification.

The Clerk: The last one was 21.

Mr. Christie: 22. I am sorry.

The Court: It will be so marked.

(The exhibit referred to was marked Plaintiff's Exhibit 22, for identification.)

The Witness: This is a comparison of the cross-sectional areas of the upper and lower radiators, the upper radiator being a part of Exhibit 20-A and the lower radiator being a part of Exhibit 20, I believe.

This indicates the volumes measured and the procedure used in measuring the cross-sectional area of the first and second radiators.

Q. (By Mr. Christie): What were your measurements, Mr. Hollingsworth?

A. The cross-sectional area of the upper radiator, part of Exhibit 20-A, was computed to be 7.093 square inches. The cross sectional area of the lower radiator, part of Exhibit 20, which was measured by filling the flue tubes with wax and then filling the rest of the radiator with water, and computing the cross-sectional area from that approach, the cross-sectional area was computed to be 26.04 square inches.

The Court: That would be a mean, would it not?

The Witness: That would be the average cross-sectional area.

The Court: 26——

The Witness: Point 04.



(Testimony of John H. Hollingsworth.)

The cross-sectional area of the first radiator, divided by the cross-sectional area of the second radiator, or 26.04, divided by 7.09, produces a ratio of 3.67, or, in other words, the average cross-sectional area of the first radiator is 3.67 times that of the second radiator.

Mr. Christie: I offer Plaintiff's Exhibits 21 and 22 in evidence.

Mr. Lyon: That is objected to unless they are restricted to the fact that they are illustrative of the witness' testimony and not proof of anything else.

The Court: I take it that is the purpose of them?

Mr. Christie: That is the purpose of them.

The Court: Received in evidence, Exhibits 21 and 22 for identification.

(The exhibits referred to, marked Plaintiff's Exhibits 21 and 22, for identification, were received in evidence.)

Mr. Christie: Mr. Clerk, the actual physical exhibits are in evidence now, are they not?

The Clerk: Yes, sir.

Q. (By Mr. Christie): Mr. Hollingsworth, I call your [64] attention to another drawing which I would like to have marked as Plaintiff's Exhibit 23 for identification.

(The exhibit referred to was marked Plaintiff's Exhibit 23, for identification.)

Q. (By Mr. Christie): Referring particularly to the drawing on the left, I ask you if you recognize it, and describe what it is.

(Testimony of John H. Hollingsworth.)

A. Yes, I recognize it. It is a full-scale drawing of that portion of the Holly Wall Heater in the area of the draft hood. It is a full-scale section drawing depicting a portion of that shown in quarter scale on Exhibit 21.

The Court: You are referring to an area where the lower heater, Exhibit 20, joins the upper heater Exhibit 20-A, is that correct?

The Witness: Yes, sir; and it depicts in detail the draft hood which is a portion of Exhibit 20 in detail, which is between the first radiator and the second radiator.

The Court: That is the figure to the left on Exhibit 23, for identification, which you just referred to?

The Witness: Yes.

Q. (By Mr. Christie): Mr. Hollingsworth, will you mark on Plaintiff's Exhibit 23 for identification the same legends and explain the gas flows, if you will, to his Honor?

A. The gas flows from the first radiator into the second radiator to be depicted by an arrow in this manner [65] (demonstrating).

Q. Is that a black arrow?

A. An arrow drawn with a pen in blue ink. I will legend those arrows "Gas Flow."

Some air is drawn into what is termed the relief opening of the draft hood.

Q. Mark the relief opening of the draft hood.

A. Room air in small quantities is drawn into the relief opening of the draft hood and mixes with

(Testimony of John H. Hollingsworth.)

the products of combustion which discharge from the draft hood into the second radiator, and then sent to the flue.

The Court: That would be, in terms of Exhibit 21, the red arrow gas, is that it?

The Witness: That is correct.

The air flow around the back of the heater is depicted by blue arrows, corresponding with those on Exhibit 21. The air moves upward between the back of the box and the wall, Exhibit 20 in the wall, up over the top of the first box and into the annulus formed by the second radiator and the jacket, which comprise Exhibit 20-A.

Q. (By Mr. Christie): Will you mark that blue arrow, please?

(Witness does as requested.)

Q. (By Mr. Christie): Tell the reporter what you have marked it. [66]

A. I am marking the blue arrow: "Air flowing upward around the first box and through the annulus provided in the second box, and then into the room through the upper grille."

Q. Mr. Hollingsworth you mentioned a draft hood; will you tell the court what a draft hood is and what its function is?

A. Yes. A draft hood is in a sense a safety device. It is essential to a gas-burning appliance that is vented. It acts as a pressure regulator or draft regulator neutralizer. It basically functions to do this: It maintains constant draft conditions or nearly constant draft conditions within the com-

(Testimony of John H. Hollingsworth.)

bustion zone of the appliance, irrespective of what the draft conditions might be in the vent above that appliance due to wind conditions or vent heights. It does that by having suitable baffling, or baffling within the draft hood arranged suitably, and a relief opening provided as part of the draft hood, so that strong draft action which would exist in the upper—in the vent, or any portion above the draft hood, could be relieved by dilution air being drawn in through the relief opening into the draft hood, and there would be little or no effect of that variation in draft on the combustion zone of the appliance. [67]

The Witness: For example, if the draft hood, or if the vents were plugged accidentally, without a relief opening being provided in the draft hood, the flame would soon become extinguished and produce a hazard. Or, if due to a sudden downdraft condition, a wind velocity were to come through the vent, rather than allow that to disturb the confines of the combustion area, the baffles are so arranged that wind velocity is directed out to the relief opening of the draft hood and would go with the products of combustion momentarily until conditions are stabilized again. Because we have no control over ventilator and draft action established by the vent, and because we must control the draft that exists within the combustion area so our gas-air mixture is held within reasonably close limits, we must provide some neutralizing device. That is the function of the draft hood.

(Testimony of John H. Hollingsworth.)

Mr. Christie: Your Honor, I propose to go through exactly the same procedure that we have with respect to the Holly heater with the two infringing models, or allegedly infringing models. Would it be convenient to have us put the legends on first? Or is this procedure satisfactory to you?

The Court: I think you might save time if you put the legends on. But you proceed in your own way. If the legends are put on during the recess——

Mr. Christie: It is a matter primarily for your preference, [68] your Honor. A great many of these points are, with respect to defendant's heaters, not contested. There are only two or three places in which there is a controversy.

Isn't that correct, Mr. Lyon?

And the great bulk of the elements in the claims are covered by the admissions now, leaving out the question as to whether or not they are all admitted.

The Court: If Mr. Hollingsworth would put the legends on during the recess, I think they would be largely self-explanatory. [69]

\* \* \* \* \*

Q. Mr. Hollingsworth, I call your attention to a physical object on which I have my hand, and ask you to tell me what it is. [70]

A. That is the Coleman heater.

Q. Did you purchase it from the defendant in this action? A. Yes.

The Court: Has it been marked?

Mr. Christie: We would like to have it marked



(Testimony of John H. Hollingsworth.)  
for identification as Plaintiff's Exhibit 24. I believe that is the next number.

The Court: It may be so marked.

(The exhibit referred to was marked Plaintiff's Exhibit 24, for identification.)

Mr. Christie: Will counsel stipulate that this is a Coleman heater, or shall we go into further identification?

Mr. Lyon: I will stipulate to it on condition that I may be allowed to examine it to see that there have been no alterations.

Mr. Christie: Certainly.

The Court: Subject to correction, you stipulate it is an accused device here?

Mr. Lyon: That is right. But I would like to inspect it.

The Court: It is a model what? What model is it?

Mr. Lyon: If your Honor please, if I might make a statement. All of these heaters are substantially the same for the lower units. That is a 67.

The Court: A Coleman model?

Mr. Lyon: This is a Coleman 67. It is used with both the three and four-foot economizer, your Honor. It is the same in both. There is no difference in the lower heater.

The Court: Very well. Do you offer it in evidence?

Mr. Christie: I offer it in evidence, your Honor.

The Court: I assume there is no objection?



(Testimony of John H. Hollingsworth.)

Mr. Lyon: Subject to my reservation to correct it.

The Court: Yes. Received in evidence. Exhibit 24, for identification, received in evidence.

(The exhibit referred to, marked Plaintiff's Exhibit 24, for identification, was received in evidence.)

Q. (By Mr. Christie): Mr. Hollingsworth, I next call your attention to this physical object on which I have my hand, and ask you to identify that if you know.

A. That is the panel or trim for the Coleman heater.

Q. The 67 heater?

A. Either of the models, I believe.

Mr. Christie: May we have the same stipulation with respect to that?

Mr. Lyon: I will make the same stipulation with respect to that, that this is——

The Court: Let's take one at a time. That shell or trim will be received in evidence as Exhibit 24-A?

Mr. Christie: The shell will be 24-A in evidence, your [72] Honor. I offer it.

The Court: All right.

Now, the next one, what stipulation do you offer with respect to that?

Mr. Lyon: The same as I did with respect to the shell.

Mr. Christie: Then I will offer them directly in evidence.

(Testimony of John H. Hollingsworth.)

The Court: Is it another model?

Mr. Lyon: No. This is——

Mr. Christie: This is the so-called——

Mr. Lyon: This is the cover to Exhibit 24.

The Court: I was trying to do too much. Exhibit 24——

Mr. Lyon: Is the inner part of the heater.

Mr. Christie: The lower box.

The Court: The lower box?

Mr. Christie: That is right. This is the casing——

The Court: And Exhibit 24-A is the——

Mr. Lyon: Cover for it.

The Court: Exhibit 24-B will be——

Mr. Christie: 24-B will be the four-foot economizer.

The Court: Very well. Received in evidence pursuant to the stipulation.

(The exhibits referred to, marked Plaintiff's Exhibits 24-A and 24-B, for identification, were received in evidence.) [73]

Mr. Christie: I'd like to offer this next exhibit, which I think Mr. Lyon will also stipulate, as the lower box of another Coleman heater of the model 67 variety as No. 25.

Mr. Lyon: Same stipulation.

The Court: Very well. It may be received in evidence.

(The exhibit referred to was received in evidence and marked as Plaintiff's Exhibit 25.)

(Testimony of John H. Hollingsworth.)

Mr. Christie: And the same stipulation with respect to the 3-foot economizer.

Mr. Lyon: And that will be 25-A.

Mr. Christie: 25-A.

The Court: Very well. It may be received in evidence.

(The exhibit referred to was received in evidence and marked as Plaintiff's Exhibit No. 25-A.)

Mr. Lyon: And it may be stipulated that the cover, 24-A, would go on either one of these, either 24 or 25.

Mr. Christie: That is correct.

The Court: Very well, gentlemen.

Mr. Christie: The burner which belongs on No. 24, I'd like to offer in evidence as 24-C.

Mr. Lyon: Same stipulation.

The Court: Very well. It may be received in evidence.

(The exhibit referred to was received in evidence and marked as Plaintiff's Exhibit No. 24-C.)

Mr. Christie: And the burner which belongs on the other [74] heater with the 3-foot economizer as 25-B in evidence.

Mr. Lyon: Same stipulation, your Honor.

The Court: Very well. It may be received in evidence.

(The exhibit referred to was received in evidence and marked as Plaintiff's Exhibit No. 25-B.)

(Testimony of John H. Hollingsworth.)

Mr. Christie: The upper grille with the 4-foot economizer, Exhibit 24-D in evidence.

The Court: Subject to the same stipulation?

Mr. Lyon: Subject to the same stipulation, except I would like to call the court's attention to the numbers "5-A," "5-B," "5-C," and "7" and "8" on 24-A. These various marks are not part——

Mr. Christie: They were marks, your Honor, made during some inter-party tests that we ran.

The Court: Very well. Exhibit 24-D is received in evidence.

(The exhibit referred to was received in evidence and marked as Plaintiff's Exhibit 24-D.)

Mr. Christie: And the same stipulation as to the upper grille for the 3-foot economizer to be marked in evidence as 25-C.

Mr. Lyon: Same stipulation.

The Court: Very well. It may be received in evidence.

(The exhibit referred to was received in evidence and marked as Plaintiff's Exhibit 25-C.)

Mr. Christie: I want to call Mr. Lyon's attention to the fact that on Exhibit 24-B, which is the 4-foot economizer, that these holes have been drilled subsequent to the inter-party tests, and were not there at the time. I will establish that by evidence.

Mr. Lyon: And they are not present as manufactured by the defendant.

Mr. Christie: That is correct.

The Court: Very well.

Q. (By Mr. Christie): Now, Mr. Hollingsworth,

(Testimony of John H. Hollingsworth.)

to save time, would you step down from the stand and explain Exhibit 24, including its various parts, Exhibits 24-A, -B and -C and -D, pointing to the various elements?

A. Exhibit 24, which is the first box of the Coleman heater and encloses what we refer to as the first radiator, and it also includes a draft hood and means provided at the outlet of the draft hood for attachment to the second radiator.

It also includes a baffle mounted in the first box between the radiator and the back of the first box; and means at the bottom to receive the burner; means on the back in the form of angle spacers to space from the wall behind the first box.

The panel, or Exhibit——

Mr. Christie: 24-A. [76]

The Witness: ——24-A, has a means whereby it may be attached over the first box to form a trim and to mount flush to the wall; and a lower discharge grille in the upper portion of the panel to provide an outlet for the air moving, warm air moving up through the first box; a means provided on the base of the panel, or at the bottom of the panel to receive air from within the room at the floor level.

Exhibit 25—is that correct?

Q. (By Mr. Christie): That's 24-B.

A. 24-B, which is the second box and radiator, or as the Coleman Company calls it, the "heat economizer," which has the second radiator enclosed in a second box providing an annulus between the



(Testimony of John H. Hollingsworth.)

radiator in the second box and opening in the bottom of the second box to allow air to travel through the annulus; and a discharge opening part way up on the second box to provide a discharge opening on the second box for the discharge of air moving through the annulus; and an upper grille which mounts adjacent to the opening to provide a cover plate; and a discharge grille for the second box.

Coupled with that is what I earlier referred to as a plaster ground, which mounts here on the unit at the time that it is installed in the wall.

The Court: Has that last item been marked?

Mr. Christie: That has not been marked. Let us mark that in evidence as 24-E.

The Court: May it be received pursuant to the same stipulation?

Mr. Lyon: The same stipulation, your Honor.

The Court: What do you call that, again?

The Witness: I term it a plaster ground.

Q. (By Mr. Christie): Mr. Hollingsworth, will you explain how the heater goes together?

A. Yes.

Q. 24-A, -B, -C, -D, and -E.

A. Yes. The second radiator attaches to the first radiator in this manner. The header plate on the bottom of the second radiator is provided with holes so that it may be attached to the wall, the studs in the wall receive it. The attachment is such that the products of combustion traveling up through the first radiator and through the draft hood can move into the second radiator and then

(Testimony of John H. Hollingsworth.)

out the top of the second radiator into a flue, which the second radiator is adapted to receive. The heat economizer is also provided with a split opening at the top or at the discharge grille, [78] and further opening at the top of the radiator.

The Court: Do those openings at the top of Exhibit 24-B permit the escape of air?

The Witness: It is my understanding that air moves discharging out of this lower section of the opening into the room, can also—let me rephrase that. Air can discharge out of the lower opening into the room. That opening is split, sealed horizontally, so that the upper portion of that opening can receive air from the room into the upper portion of the economizer and discharge into the attic, on this four-foot economizer.

Q. (By Mr. Christie): Would you now describe the Exhibit 25-A, -B, et cetera, the other furnace with the three-foot economizer?

A. Yes. The other furnace, Exhibit 25— is that correct?

Q. That is correct.

A. (Continuing) —is, as Mr. Lyon stipulated, basically the same as Exhibit 24. There are minor differences. There are very minor differences in the construction from the draft hood area. Also Exhibit 24 has tabs provided on the side of the box up near the top, which do not exist on Exhibit 25. Other than that they are essentially identical. Exhibit 25 also has the same elements of construction in it that Exhibit 24 does, in that it is adapted to re-

(Testimony of John H. Hollingsworth.)

ceive a burner at the [79] bottom, and the same general description that applies to Exhibit 24 would apply to Exhibit 25.

Exhibit 25-A, which is the three-foot economizer, has a second radiator and a second box, means of attaching the second radiator to the outlet of the first box, a header plate providing means of attaching the heat economizer to the wall studs, and differs from the four-foot heat economizer in that the annulus provided between the radiator and the second box is no longer open directly underneath the header plate, but rather through an opening provided adjacent to the header plate at the base of the second box, so that air may move into that opening up through the annulus and be discharged into the room.

The upper portion differs from the four-foot economizer in that the air that is introduced into the upper half of the split opening in some instances, where provided with the proper flue pipe, will not be discharged into the attic, but rather will be introduced into the flue pipe itself.

The second three-foot economizer is also provided with the same plaster ground and same upper grille as the four-foot economizer.

The Court: Has that plaster ground been identified?

Mr. Christie: Let's identify the plaster ground as Plaintiff's Exhibit 25-D, and I offer it in evidence subject to the same stipulation. [80]

Mr. Lyon: The same stipulation, your Honor.

(Testimony of John H. Hollingsworth.)

The Court: Very well. Received in evidence.

The Clerk: 25-D.

(The exhibit referred to, marked Plaintiff's Exhibit 25-D, for identification, was received in evidence.)

Q. (By Mr. Christie): Mr. Hollingsworth, have you installed the furnaces represented by Exhibits 24-A with the various letters and Exhibit 25-B with the various letters, in a wall and run tests on them? A. Yes, I have.

Q. In doing so what did you follow by way of instruction?

A. For installing the heaters in the test wall I followed the published installation instructions that were supplied by the Coleman Company with the heaters.

Mr. Christie: I ask that this document entitled "How To Install Coleman Gas Wall Heater" be marked for purposes of identification as Plaintiff's Exhibit 26.

The Court: Is it stipulated to be a true copy of what it purports to be, Mr. Lyon?

Mr. Lyon: That is just what I am taking a look to see.

The Court: Subject to correction?

Mr. Lyon: Yes, your Honor.

The Court: Received in evidence as Plaintiff's Exhibit 26. [81]

(Testimony of John H. Hollingsworth.)

(The exhibit referred to, marked Plaintiff's Exhibit 26, for identification, was received in evidence.)

[See Book of Exhibits.]

Mr. Lyon: I would like to call the court's attention, before further marking this exhibit, that this Exhibit 26 has previously been marked, "4-7-54, Plaintiff's Exhibit 11," with the initials M.S. Those are not the present markings, and those were marked at a previous taking of depositions, so that the record will show what those markings are.

The Court: Is that agreed?

Mr. Christie: That is agreed.

The Court: Very well.

Q. (By Mr. Christie): Now, in installing Plaintiff's Exhibits 24 and 25, did I understand you to testify that these are the instructions you followed?

A. Yes, they are.

Q. In installing the four-foot heat economizer, which is identified as Plaintiff's Exhibit 24-B, what instructions did you follow?

A. I followed the installation instructions with reference to the vertical location and the manner in which the economizer should be installed.

Q. I show you a photostat of a drawing, which I will ask Mr. Lyon to inspect, and ask you if these are the instructions you followed with respect to the installation of the four-foot economizer? [82]

Mr. Lyon: I will make the same stipulation, that this was literature put out by the Coleman



(Testimony of John H. Hollingsworth.)

Company. I mean that this is a copy of such literature.

The Court: Instructions to install——

Mr. Lyon: Yes, sir.

The Court: What? The three-foot economizer?

Mr. Christie: Four-foot.

Mr. Lyon: This is the 48-inch economizer.

The Court: It will be received in evidence as Exhibit 27, Mr. Clerk.

Mr. Christie: As 27.

The Clerk: Yes, your Honor, No. 27 is the next one.

(The exhibit referred to, marked Plaintiff's Exhibit 27, for identification, was received in evidence.) [83]

[See Book of Exhibits.]

Q. (By Mr. Christie): I will ask you now, Mr. Hollingsworth, with respect to the instructions that you followed in the installation of the 3-foot economizer, which is Plaintiff's Exhibit 25-A, if these are the instructions you followed?

A. Yes, they are. I followed these instructions on the installation of the 3-foot economizer.

Mr. Christie: I will ask the same stipulation as to authenticity.

Mr. Lyon: The same stipulation, your Honor. I note on 26, 27, and this is 28, there are some markings on them in what would appear to be longhand. Those were not part of the instructions.

The Court: Only the printed portion?

Mr. Lyon: Only the printed portion.

(Testimony of John H. Hollingsworth.)

Mr. Christie: That is understood.

Mr. Lyon: And he is only offering the printed portion. I don't know, and I don't think he knows——

Mr. Christie: Well, I do. Mr. Kice put them on when we got them from him.

The Court: The instructions last identified are received in evidence as Plaintiff's Exhibit No. 28.

(The exhibit referred to was received in evidence and marked as Plaintiff's Exhibit No. 28.)

[See Book of Exhibits.]

Q. (By Mr. Christie): I hand you now, Mr. Hollingsworth, [84] a group of photographs which Mr. Lyon has already seen and——

Mr. Lyon: Yes, I have seen those.

Q. (By Mr. Christie): ——and I will ask you if these photographs illustrate the test installation that you testified you made in accordance with the installation instructions?

Mr. Lyon: I will stipulate those were the photographs of that installation at the time those tests were made and the depositions taken.

The Court: They truthfully and fairly depict what they purport to depict?

Mr. Lyon: They certainly do.

The Court: Have they been numbered?

Mr. Christie: I ask that this group of photographs be marked in evidence respectively as Plaintiff's Exhibits 29, 29-A, 29-B, 29-C and 29-D.

(Testimony of John H. Hollingsworth.)

The Court: So ordered. They may be received in evidence.

(The photographs referred to were received in evidence and marked as Plaintiff's Exhibits 29, 29-A, 29-B, 29-C and 29-D.)

[See Book of Exhibits.]

Mr. Lyon: Do you want to add this one? I will make the same stipulation.

Mr. Christie: Let's mark this one as a further exhibit, and mark it 29-E. [85]

The Court: Pursuant to the stipulation, Exhibit 29-E, the photograph, is received in evidence.

(The photograph referred to was received in evidence and marked Plaintiff's Exhibit No. 29-E.)

[See Book of Exhibits.]

Q. (By Mr. Christie): Mr. Hollingsworth, over the noon recess I asked you if you would mark Plaintiff's Exhibit 21 to identify the elements in the two Coleman heaters with the 3-foot and 4-foot economizers. Have you done so? A. Yes.

Q. Would you now describe to the court the several elements in the heaters as shown on Exhibit 21?

A. Before we recessed, I had marked there on the stand the left-hand portion of Exhibit 21, which was the cross-sectional view of the Holly wall heater. During the recess I marked the other two——

Mr. Christie: Would it save time if we marked this one "Holly," the one on the left; and this one

(Testimony of John H. Hollingsworth.)

“Coleman 3-foot” and this one “Coleman 4-foot” for identification purposes?

The Court: You are referring to the three figures appearing on Exhibit 21?

Mr. Christie: Yes, Your Honor.

Mr. Lyon: I think that would clarify his testimony.

The Court: You are marking the first figure on the left “Holly,” to indicate that is one of the plaintiff’s heaters? And the second one is—— [86]

The Witness: The Coleman 3-foot economizer.

The Court: And the figure to the right?

The Witness: Coleman 4-foot economizer.

Q. (By Mr. Christie): Now, I will ask you, Mr. Hollingsworth, whether the figure that you marked “Coleman 4-foot economizer” shows accurately the installation of the Coleman furnace, Exhibit 24, and the Coleman economizer, Exhibit 24-A in a wall in accordance with your understanding of the installation instructions?

A. Yes, it does.

Q. Now, will you explain to the court what the several elements shown on the Coleman with the 4-foot economizer, Plaintiff’s Exhibit 21, are, and how the apparatus operates?

A. Starting at the bottom, and referring to the 4-foot economizer, Coleman, this is the gas burner. The red arrow depicts the gas-air mixture that is burned in the first radiator moving up through the first radiator, through the draft hood, into the second

(Testimony of John H. Hollingsworth.)

radiator, and thence out into the vent. The blue arrow depicts——

The Court: Thence out the flue?

The Witness: Out the flue, yes. The blue arrows depict air movement outside the first box, and in the wall up behind the box and into the annulus between the—provided in the heat economizer between the radiator and the shell of the box, and thence out the upper grille. The yellow arrows [87] depicts the circulating warm air that is moving up around the first radiator and within the first box, discharged into the room through the lower grille.

I have also denoted the wall structure, the back wall, the first radiator, the baffle, the first box assembly, the air passage between the second radiator and the second box, the second radiator, the second box itself, and the upper grille.

The same description would apply to the Coleman with the 3-foot economizer.

Q. How does the 3-foot economizer differ from the 4-foot economizer? Or to put it another way, how does the furnace equipped with the 3-foot economizer differ from the furnace equipped with the 4-foot economizer?

A. The furnace equipped with the 3-foot economizer is mounted in the wall in such a manner that the space between the top of the first box and the bottom of the economizer is less than that of the 4-foot economizer.

The Court: You mean the open space, or——

The Witness: The space provided between what



(Testimony of John H. Hollingsworth.)

I have termed the header plate and the bottom of the economizer and the top of the first box is restricted on the 3-foot economizer installation as compared to that of the 4-foot economizer, as can be shown here by observing the drawings, the difference in the—— [88]

The Court: Does that appear, that difference in space appear to you to perform any function?

The Witness: It performs some function in this respect, your Honor: It does tend to restrict the air flow of that air moving up behind the first box and over into the economizer.

The Court: Now, you are referring to the blue arrows?

The Witness: Yes, I am.

The Court: Well, you mean that less air would flow from the space between the wall and the box?

The Witness: Yes, by virtue of the fact that the draft that's available in these two is basically the same, but the restrictions provided by this restricted space here, or the resistance to flow is provided by that restriction, it would reduce the amount of air that flowed up behind the first box and over through this space (indicating).

The Court: Would that in turn reduce the amount of so-called air that is released, flue air released through the upper vent, or upper grille?

The Witness: Yes.

Mr. Lyon: If your Honor please, I hope that we are not annoying you by coming here, but in this type of case——

(Testimony of John H. Hollingsworth.)

The Court: It is necessary.

Mr. Lyon: I have my expert, and so forth.

The Court: That is quite all right.

Mr. Lyon: Thank you. [89]

The Court: Have you finished with the drawing?

Mr. Christie: Yes, your Honor.

The Court: That is Exhibit 21.

Mr. Christie: Yes.

Q. (By Mr. Christie): Mr. Hollingsworth, have you compared the horizontal cross-section of the upper radiator and the lower radiator in the Holly heater with the 4-foot economizer?

A. The Coleman—I don't understand.

Q. I am sorry. A. The Coleman?

Q. I will rephrase it. In the Coleman heater with the 4-foot economizer.

A. Yes, I have.

Q. How did you do that?

A. I calculated the cross sectional area of the upper radiator mathematically, and by taking measurements, being a uniform constant, uniform section over its full length, I was able to do that. On the first radiator I was able to do that by computations only to the extent of approximating the area. So I had a method run under my direction whereby we sealed the tube at the top of the first radiator and filled the radiator with water, and then based on the volume and density of the water and height of the radiator, we were able to determine accurately the mean cross-section area of the first radiator. [90]

(Testimony of John H. Hollingsworth.)

Q. I show you a sheet of paper, which I will ask the clerk to mark as Plaintiff's Exhibit 30—is that it?

The Clerk: 30.

Mr. Christie: For purposes of identification.

(The document referred to was marked Plaintiff's Exhibit 30, for identification.)

Q. (By Mr. Christie): And I ask you if this states the calculation that you have just described.

A. Yes, it does.

Q. What would you say with respect to the Coleman heater with the three-foot economizer?

A. That the cross-sectional areas—comparing the cross-sectional areas in the first radiator and the second radiator would produce the same results. It is only the height of the economizer that differs.

Q. (By Mr. Christie): What did you determine to be the cross-sectional area of the lower or first radiator in the Coleman furnace?

A. 17.83 square inches.

Q. What did you determine to be the cross-sectional area of the upper radiator in the secondary heat exchanger?

A. 9.28 square inches.

Q. Have you calculated the ratio between the two?

A. Yes. The ratio between the two, dividing the cross-sectional area of the lower radiator by that of the upper [91] radiator produces a ratio of 1.92.

The Court: What was that figure for the upper radiator?

The Witness: 9.28, your Honor.

(Testimony of John H. Hollingsworth.)

The Court: And 17.83 over 9.28 gives you what?

The Witness: 1.92.

Mr. Christie: I ask that this document be marked in evidence as Plaintiff's Exhibit 30.

Mr. Lyon: No objection as illustrating the witness' testimony only.

The Court: Yes. That was the purpose?

Mr. Christie: Yes, that was the purpose.

The Court: Received in evidence.

(The document referred to, marked Plaintiff's Exhibit 30, for identification, was received in evidence.)

[See page 526.]

Q. (By Mr. Christie): Mr. Hollingsworth, in connection with the showings of the Coleman furnace with the three-foot economizer and with the four-foot economizer, on Plaintiff's Exhibit 21, you testified with respect to certain blue arrows, that the gas flows in certain ways as indicated by the blue arrows, or that the air flows. Did you conduct any tests that show this to be the fact?

A. Yes, I did.

Q. If so, describe them.

A. Yes, I conducted several tests.

I conducted tests with the heater installed in the test [92] wall structure provided with a glass back panel, which simulated the rear wall, by introducing smoke in the form of titanium tetrachloride at the base of the heater, where I have described the air enters. I was able to observe smoke traveling

(Testimony of John H. Hollingsworth.)

upward behind the first box and into the economizer or second box and out the upper grille.

Q. I hand you this group of six photographs, which are marked, respectively, Plaintiff's Exhibits 29, -A, -B, -C, -D, and E, and ask you to tell me whether you can show the court on those photographs where the smoke was introduced and what happened to it. A. Yes.

Q. Referring specifically to the individual photographs by letter. The first one is marked 29, the rest have a subscript -A, -B, -C, -D, and E.

A. Exhibit 29 would show the wall structure in which the heater was mounted. It also shows the test tunnel, which was used for other tests than these that I am going to describe at the moment, and which was not on the appliance at the time that I conducted the smoke tests. This one illustrative of the test installation (indicating).

The Court: "This" is Exhibit——

The Witness: Which is Exhibit 29-B. That would be illustrative of the test arrangement as it stood when I tested with titanium tetrachloride smoke. [93]

Q. (By Mr. Christie): Can you show from that photograph where you introduced the titanium tetrachloride?

A. Partially. I introduced it with a smoke wand through the aperture on the base of the panel, as can be seen here in Exhibit 29-B.

The Court: By the panel you refer to Exhibit



(Testimony of John H. Hollingsworth.)

24-A? Not the photograph, but the physical exhibit.

The Witness: Yes, that is correct.

I also introduced smoke with a bulb and pot arrangement, which provided means of introducing titanium tetrachloride into the test structure through the back of the wall, as illustrated in Exhibit 29-D, which shows the glass back panel on the rear wall of the installation. Inserted at the base of that panel were short sections of tubing which discharged into the warm air stream at various locations. Three of these locations being at the very base of the heater. One of the locations being part way up on the—behind the box back, but in the space between the box and the glass panel.

The Court: Which would correspond to the space between the box and the wall?

The Witness: Which would correspond to the space between the box and the wall.

The smoke introduced at any of these locations could visually be observed as going up behind the heater, and smoke [94] could be observed coming out the upper grille of the economizer.

Q. (By Mr. Christie): Did you see the smoke travel in the course that you have spoken of?

A. Yes, I did.

Q. Now, this testimony applies to the three-foot or to the four-foot economizer installation?

A. This specific test applies—the specific ones to which I am referring, in light of Exhibit 29-D, refer to the three-foot economizer.

Q. Did you observe the same facts and make

(Testimony of John H. Hollingsworth.)

the same tests with respect to both the three-foot economizer installation and the four-foot economizer installation?       A. Yes, I did.

Q. Did you observe the same results?

A. I observed essentially the same results. I observed that there was air movement up the back of the box between the box and the wall and up into—and out of the economizer grille, in both the three and four-foot economizer installations.

Q. I understood you to testify that these smoke tests were made without the tunnel placed in front?

A. They were made both ways, as a matter of fact. However, the specific tests that I have been discussing were made without the tunnel being attached to the front. However, the [95] same results were produced in subsequent tests with the tunnel attached to the front, so in terms of what I observed I can say that it applied in both instances whether the tunnel was attached or not attached.

Q. I call your attention to the photograph marked 29-E, and particularly the upper portion of the photograph, and I ask you to tell me what it shows.

A. It shows the back of the heater. It shows the glass back panel, which simulates the rear wall. It shows the gap between the header plate or bottom of the economizer in the top of the box, which provides a space for air movement over the top of the box and up into the economizer, as illustrated in the center cross-sectional view on Exhibit 21.

Q. Did you introduce smoke at any place other

(Testimony of John H. Hollingsworth.)

than the back of the heater in the test you have described?

A. Yes, smoke was introduced at other spots. It was introduced at the sides of the heater, too, between the sides of the box on Exhibit 24, I believe, the first box, and the stud space in the wall.

Q. What did you observe with respect to that smoke?

A. I observed that that smoke flowed upward between the box and the wall, and that introducing smoke in that manner produced smoke from the economizer grille, upper grille.

Q. From the upper grille?

A. Upper grille of the economizer. [96]

Q. In both the case of the three-foot economizer and the four-foot economizer? A. Yes.

Q. Are you able to testify on the basis of the smoke tests anything with respect to the quantitative volume of smoke?

A. I would testify quantitatively only in this respect: that I observed and set up a test procedure which Mr. Henry Landsberg ran with a tracer gas, in which he used a sensitive detector to determine the quantity—quantitatively the amount of air that was moving up the back of the box and into the economizer and out the economizer grille.

Q. This was something else, though; this did not involve the observation of the smoke? Or did it?

A. No. It only substantiated that quantitatively.

Mr. Christie: Your Honor, we have a witness here, the young man who actually made the certain

(Testimony of John H. Hollingsworth.)

measurements. He is a student at Caltech, and he has been here since noon. I wonder if I could indulge by stopping Mr. Hollingsworth's testimony for a moment simply to put him on the stand and ask him to testify with respect to certain physical measurements that he made?

The Court: Is there any objection?

Mr. Lyon: If he will state what physical measurements [97] they were, because otherwise he probably will have to come back anyway in the morning, because we only have a few moments left.

Mr. Christie: I think it is very short.

Mr. Lyon: What is he going to testify to?

Mr. Christie: He is going to testify that he filled the radiators with water and the quantities that he got, and how he got the results.

Mr. Lyon: I will accept the testimony of Mr. Hollingsworth as to that, your Honor.

The Court: That has to do with the cross-sectional measurement?

Mr. Lyon: That's right. If that is all that he is for, I will stipulate that he would testify the same as these exhibits are, that he did as it states in Exhibits 22, and 30.

The Court: Let's get it in form, now.

What is the name of your witness, Mr. Christie?

Mr. Christie: His name is Mr. Walter Biggars.

The Court: Will it be stipulated, gentlemen, that Walter Biggars will be deemed to have been called on behalf of the plaintiff, and to have sworn and testified that he made those cross-sectional tests in

(Testimony of John H. Hollingsworth.)  
the manner described in the testimony of Mr. Hollingsworth who is now on the stand, and that he reached the results that Mr. Hollingsworth has [98] stated?

Mr. Lyon: And that is set forth in Exhibits 22 and 30.

The Court: As the results of the measurements?

Mr. Christie: Yes.

We have, in his own handwriting, the report that he made.

The Court: Will you accept Mr. Lyon's statement about 22 and 30?

Mr. Lyon: As the summation of his report.

Mr. Christie: They are the summation of his report.

Mr. Lyon: I will stipulate that if called, he would so testify.

The Court: And that he will be deemed to have so testified?

Mr. Lyon: Yes, that he will be deemed to have so testified.

The Court: Very well. Do you accept the stipulation?

Mr. Christie: Yes, I accept the stipulation, your Honor.

If your Honor is interested, from the standpoint of explanation, we have here the sketches that Mr. Biggars actually made showing the sections which he filled with wax and the sections that he filled with water. Would this be useful to you?



(Testimony of John H. Hollingsworth.)

The Court: I think not, unless there is some issue on the subject. [99]

Is there some issue as to these measurements?

Mr. Lyon: No. The only issue in this matter, your Honor, is—I will agree that the total area is as they state, but I do disagree that that is the cross-sectional area of this device.

Mr. Christie: In that case, your Honor, I would like to put in evidence Mr. Biggar's calculation. I offer it as Plaintiff's Exhibit 31.

The Court: Will it be stipulated that——

Mr. Christie: Will you stipulate that this is something——

Mr. Lyon: I will stipulate that this was made by Mr. Biggars, but——

Mr. Christie: And if called he would so testify?

Mr. Lyon: Yes.

The Court: Very well. It is received in evidence pursuant to the stipulation as Plaintiff's Exhibit—30, Mr. Clerk?

The Clerk: 31, your Honor.

The Court: As Plaintiff's Exhibit 31.

Mr. Lyon: As illustrative of what he would testify to.

The Court: Of Biggars' testimony.

Mr. Lyon: Yes.

(The exhibit referred to, marked Plaintiff's Exhibit 31, for identification, was received in evidence.) [100]

[See page 527.]

(Testimony of John H. Hollingsworth.)

The Court: Exhibits 22 and 30 contain the results of the cross-sectional measurements?

Mr. Lyon: That is right, your Honor.

Mr. Christie: The Exhibits 22 and 30, that is correct.

Q. (By Mr. Christie): Mr. Hollingsworth, I show you Plaintiff's Exhibit——

Mr. Lyon: I believe, your Honor, this witness that he was going to call could be excused.

Mr. Christie: Correct.

The Court: Very well.

Mr. Christie: Thank you, Mr. Biggars.

Q. (By Mr. Christie): Mr. Hollingsworth, I call your attention to Plaintiff's Exhibit 31 and ask you if you will identify on the exhibit the portions of the radiators that were filled with water as you have testified to?

A. Would you like me to show that on the physical units?

Mr. Lyon: If you would, please.

Mr. Christie: Also mark it on the exhibit.

The Witness: On the physical exhibit?

Mr. Christie: No——

Mr. Lyon: Mark it with a red pencil on the physical exhibit, if you don't mind.

Mr. Christie: That will be perfectly all right.

The Witness: I believe it is marked on Exhibit 31 [101] already.

Q. (By Mr. Christie): Would you mark it on the physical exhibit No. 24, Mr. Hollingsworth?

A. Yes.

(Testimony of John H. Hollingsworth.)

This area across here, from here up, was filled with wax, so that it was this area from here down that was filled with water.

The Court: The clerk has some white chalk, gentlemen.

The Witness: That will be better.

The Court: You are indicating an area in there——

The Witness: This area was the area measured with water. This area from here up was filled with wax.

Q. (By Mr. Christie): The area from where the shoulder is on the radiator, from there on up was filled with wax, is that correct?

A. Yes, that is correct.

Q. We are now talking about Plaintiff's Exhibit No. 24, and the lower radiator which appears in that exhibit.

Mr. Lyon: The white mark denotes——

The Court: The top of the water?

Mr. Lyon: The top of the water, and the bottom of the wax.

The Court: Is that agreed?

The Witness: That is agreed.

Mr. Christie: Actually, wasn't it the other way around? [102] Didn't you have it upside down.

The Witness: In its present position that would be correct. Actually, as we measured it would obviously be the other way.

Q. (By Mr. Christie): In other words, you

(Testimony of John H. Hollingsworth.)

filled it with wax to the level indicated by the white chalk——

A. I will put “W” here for Wax in that area. I had better put “W-a-x” for Wax in this area, and write “Water” down here.

Q. And you filled it with water to what point?

A. This was mounted vertically, of course, and it was filled with water—it was filled with as much water as we could put in it.

Q. Now, will you make the same remarks, explanation, with respect to the radiator in Plaintiff’s Exhibit 20? [103]

The Court: That is the Holly?

Mr. Christie: That is the Holly.

The Court: All right.

The Witness: The tubes were filled with wax to again what I would term the shoulder of the radiator so that this area up here did not include any water volume.

Q. (By Mr. Christie): Did you in this case follow the same procedure of filling the tubes with wax, turning the radiator upside down and filling the rest with water? A. Yes.

Q. Will you mark on Plaintiff’s Exhibit 20 the portion that was filled with wax, just as you have done with the other one, and also mark where water was placed?

A. (Witness complies.)

Mr. Christie: That concludes our testimony on the prima facie—oh, excuse me. I have one other point.

(Testimony of John H. Hollingsworth.)

Q. (By Mr. Christie): I call your attention again, Mr. Hollingsworth, to Plaintiff's Exhibit 23, upon which I asked you over the noon hour to add the same legend on the Coleman pictures that you had on the Holly pictures. I will ask you again, to avoid confusion, if you will mark the left-hand picture about which you have already testified as "Holly," and mark the center picture as the "Coleman 3-foot economizer"; and the other as the "Coleman 4-foot economizer."

I notice that you have marked a certain legend on the [104] arrow pointing to the blue line in the device marked the "Coleman 3-foot economizer." Will you describe that legend and tell me——

A. Yes. I wrote that the air flowing upward around the first box and through the annulus provided in the second box and into the room through the upper grille is denoted by the blue arrows.

Q. I notice certain green arrows on that. What do they denote?

A. They denote that air that is drawn in there through the louvres at the top of the Coleman panel, Exhibit——

Q. 24-A.           A. ——24-A.

Q. Do you want to show that actually to the court?

A. These louvres at the top of the panel are illustrated on the cross-sectional drawings, and green arrows are used to denote the air that is drawn in through those louvres into the economizer.

Q. Now, what have you to say with respect to



(Testimony of John H. Hollingsworth.)

that portion of Plaintiff's Exhibit 23 that is marked "Coleman 4-foot economizer"?

A. I have marked it in the same manner. I have indicated, or denoted the blue arrows in the same manner, described the blue arrows in the same manner I did on the 3-foot economizer. [105]

Q. And do these drawings of the 3-foot and 4-foot economizers that you have testified to—what exactly are these? I don't believe you told us.

A. I believe I previously——

Q. You made that testimony with respect to the Holly, but you didn't——

A. These particular pictures of the Coleman 3-foot economizer——

The Court: You are referring to Exhibit 23?

The Witness: On Exhibit 23—the pictures showing the Coleman 3-foot economizer and Coleman 4-foot economizer, or rather identified by those captions, show the sections in full scale of the Coleman installation in the area of the draft hood and its attachment to the base of the economizer.

Q. (By Mr. Christie): In ink you marked on the 3-foot economizer an arrow marked "gas flow." What does that mean?

A. That illustrates the directional flow of the gases that are burned in the first radiator and are flowing up through the draft hood into the second radiator.

Q. What is your testimony with respect to the arrow marked "gas flow" on the Coleman 4-foot economizer drawing on Plaintiff's Exhibit 23?

(Testimony of John H. Hollingsworth.)

A. That would be the same as on the 3-foot economizer.

Q. What would you say with respect to the scale of the drawing on the Coleman? [106]

Mr. Lyon: That has been asked and answered. He said it was the same full scale.

The Witness: Full scale to accurate dimensions.

Mr. Christie: That concludes our testimony from Mr. Hollingsworth on the prima facie case, your Honor.

Mr. Lyon: I will probably have long cross examination of this witness, your Honor.

The Court: Very well.

Mr. Lyon: I would like to start, though, for five minutes.

The Court: Very well.

#### Cross Examination

Q. (By Mr. Lyon): Mr. Hollingsworth, have you described the operation on either the 4-foot or 3-foot Coleman heaters? A. Yes.

Q. Completely?

A. No, I would say not completely.

Q. Why didn't you describe it completely?

A. Well, because it would become rather involved to go through the process of combustion and what takes place there; the aspects that involve dilution air sucked into the draft hood, and many of the minor conditions that would exist with the appliance. It didn't seem to me that they were significant.

Q. It didn't seem at all necessary for you to

(Testimony of John H. Hollingsworth.)

describe to this court the proposition that the Coleman heater takes in air for the economizer directly from the room instead of from the back of the furnace, did it?

A. I believe I mentioned the fact that the air was drawn, some of the air was drawn in through the front of the economizer.

Mr. Christie: He just got through testifying with respect to the green arrows.

Mr. Lyon: I object, unless counsel makes an objection to the question——

The Court: Let's not interrupt the examination.

Mr. Christie: I am sorry.

Q. (By Mr. Lyon): Did you not testify that the cooling of this jacket up here for this economizer was from the air coming up the back?

A. Yes.

Q. And you didn't at that time make mention, or bother to state that there was air also taken up directly from the room, did you?

A. No. \* \* \* \* \* [108]

Q. (By Mr. Lyon): Mr. Hollingsworth, in the Coleman heater, actually doesn't the majority of the cooling of either size of economizer, the air for that cooling enters at the points marked 7 and 8 on Exhibit 24-A? [109]

Mr. Lyon: Is that correct? I think that is right.

The Court: 24-A is the trim, according to my notes.

The Witness: Would you repeat that question, please?

(Testimony of John H. Hollingsworth.)

Mr. Lyon: Will you read it, please?

(The question was read.)

The Witness: No; most certainly not.

Q. (By Mr. Lyon): Now, have you ever measured the area, for example, where air can enter the economizer from the back of the Coleman heater and the area from which it may enter directly from the room, through the vents 7 and 8?

A. No, I didn't.

Q. Would you still state that more air enters from the back on the Coleman heater?

A. Certainly.

Q. And yet would you still make that statement if you were shown that the area of the opening is in a ratio of 1 to 18?

A. I wouldn't be concerned with the area, Mr. Lyon, because I would be chiefly concerned with the draft action that was available concerning that area, rather than the area itself.

Q. Where does that draft action come from?

A. I believe, as I stated to the court earlier in my testimony, referring to Exhibit 21, that this conduit here which—— [110]

Mr. Christie: Let's identify that conduit, Mr. Hollingsworth.

The Witness: ——which is the——provides the conduit which is formed by the back of the box and the rear of the wall through which the air moves, denoted by blue arrows, that the draft action available there is substantial because the air is heated. I believe I testified that there was less air

(Testimony of John H. Hollingsworth.)

moving through the area to which I believe you were referring on the 3-foot economizer than on the 4-foot economizer——

Mr. Lyon: We are discussing the 3-foot economizer. Let us stay with the 3-foot for a moment.

The Court: It is after 3:00, gentlemen.

Does the plaintiff wish to offer Exhibit 23 for identification into evidence? According to my notes it is still marked for identification only.

Mr. Christie: I would like to mark it in evidence.

Mr. Lyon: As illustrative only of the witness' testimony.

The Court: Is that the purpose?

Mr. Christie: Yes, sir.

The Court: It will be received for that purpose. Exhibit 23 for identification is received in evidence.

(The exhibit referred to was received in evidence and marked as Plaintiff's Exhibit No. 23.) [111]

\* \* \* \* \*

Mr. Lyon: Before we resume the testimony, your Honor, I would like to ask the court's plan of procedure in this case. Will we go ahead next Tuesday?

The Court: Yes. We will go ahead until we finish. Are they any out-of-town witnesses we can dispose of this afternoon?

Mr. Lyon: No, there are not. Why I ask is that I had that case in the other district, and if we were going to continue this, I would leave tonight for



(Testimony of John H. Hollingsworth.)

the East. But if we are not, we will get that case continued.

The Court: Very well. We will proceed here.

Mr. Lyon: Thank you.

Q. You have used in your testimony the word "cross-section." [115] What does the word "cross-section" mean?

A. Referring to area, it means the number of square inches in a horizontal plane. When I am speaking of a conduit such as we have been discussing, which is normally in a vertical position—or, in other words, it is the number of square inches of passageway there are available in that conduit.

The Court: If it is irregular in shape, your cross-section would have to be an average, would it, or mean?

The Witness: An average or mean cross-section, yes.

Q. (By Mr. Lyon): Now, Mr. Witness, are you not defining the words "mean cross-section" now; not "cross-section"? What does the term "cross-section" mean?

A. Cross-section would refer——

Q. I don't mean in reference to these exhibits. I mean the term cross-section in your definition of it.

A. Cross-section would have to refer to something. It could be cross-section to many different things. I would have to speak in terms of a conduit or some such thing. [116]

Q. All right. I have a pitcher here in my hand;

(Testimony of John H. Hollingsworth.)

what would the cross-section of that pitcher be?

A. You will have to define it to a greater degree than that before I could answer it.

Q. That is my point. There is no definition of a cross-section, then?

A. Oh, no, I wouldn't say that.

Q. Then what is the cross-section of this pitcher?

A. It would depend on what you would refer to as a cross-section in the art of making a pitcher, for example.

Q. In other words, I could have, as far as the words "cross-section" are concerned on this pitcher, I could take a section through here (indicating), which would amount to a plane, and that would amount to a cross-section, would it not?

A. Under certain conditions, yes.

Q. Under what conditions?

A. Yes, it would be a cross-section, that is correct.

Q. It is, isn't it? Not it could be, but it is?

A. It is a cross-section, yes.

Q. And if I put a plane through here (indicating), that surface that is made by that plane is a cross-section of this pitcher up here, isn't it?

A. Yes.

Q. And the same thing on the exhibits which constitute [117] both the defendants' devices and the plaintiff's, a cross-section could be right through the part—may I have a piece of chalk, please?—that I will mark on Exhibit 20-B, this would be a cross-section of this radiator, would it not, where I

(Testimony of John H. Hollingsworth.)

am drawing a white line, just above the word "Wax"?

A. In the trade that would not be considered as a cross-section.

Q. I didn't ask you about in the trade. As a physical fact, a plane through there would be a cross-section?

The Court: Isn't a cross-section, gentlemen, the view or area obtaining by bisecting any object at a given point?

Mr. Lyon: That is what I am trying to get this witness to admit.

The Witness: Yes, sir, I agree with that.

Q. (By Mr. Lyon): Then how can you say that the cross-section of this heater, Exhibit 20-B, a cross-section of that heater is any particular value, unless you state where on that heater the cross-section is taken?

A. I don't understand the question, I don't believe. Are you speaking specifically of the first radiator when you say "heater"?

Q. All right. I am speaking of the radiator in Exhibit 20-B, isn't it just as fair to say that the line I just drew is a cross-section of that radiator, as any other point on the [118] heater?

A. No, I don't believe so. Because that tube is not considered to be a part of the radiator in normal trade expressions.

Q. Then, this radiator in Exhibit 20-B doesn't connect with the second radiator, does it?

A. Oh, yes, it does.

(Testimony of John H. Hollingsworth.)

Q. How?

A. Indirectly it connects with the second radiator through the tubes in the draft hood.

Q. Doesn't the patent say the second radiator is attached to the first radiator?

A. I don't recall the specific wording.

Q. But this is not part of the radiator, the part where it says, "Wax"?

A. If I were referring to the cross-section of the first radiator——

Mr. Lyon: Will you please read the question to the witness.

(The question was read by the reporter.)

The Witness: No.

Q. (By Mr. Lyon): That is not part of the radiator. Then how do you define a radiator, please?

A. I would like to continue with my answer to that other question first, if I may. [119]

It is a physical portion of the first radiator in that it is a part of the same material and the same stamping, but I still must refer to the definition by the trade of a radiator; and in referring to the cross-section of the radiator I would not, being familiar with the term "Radiator" as used in the trade, consider the tube as part of the radiator.

Q. Then, can you define for me what you mean by the term radiator?

A. The term radiator can apply to, or does apply to a heat transfer surface, a heat exchange surface, one side of which is in contact with flue gases, the other side which is in contact with air.

(Testimony of John H. Hollingsworth.)

It can include a combustion zone or it may include only a portion of that heat exchange surface that is somewhat removed from the combustion zone. By that I mean this: that if I referred to the first radiator in which the burner was located, it would include the combustion zone of the appliance. If I referred to the second radiator, which is substantially removed from the burner, it would be, then, a heat exchange surface which is in contact with the flue products after they had passed through the combustion process.

Q. Now, these necks I refer to on Exhibit 20-B that have the word "Wax," do they not have their total—Strike that question. I need a preliminary one. [120]

Do these portions marked "Wax" that you call conduits, or something, not contain flue gases and heat gases? A. Yes, they do.

Q. And do they not radiate into the box of this heater? A. Yes, they do.

Q. Then they are a radiator?

A. Not necessarily, because the draft hood would do that same thing, and I would not call the draft hood the radiator.

Q. Then, how do you distinguish these necks, whatever you want to call them, from the main part?

A. By trade terminology. I believe, first, it would be necessary for you to understand the function of the tube as it is designed. It performs a double function. It connects the radiator with the draft



(Testimony of John H. Hollingsworth.)

hood, and the area of the tube is controlled in such a manner that it acts as a control over the gas-air mixture in the radiator. It is a partial draft control over the first radiator. And functionally it is probably more a portion of the draft hood than it is anything else in its function.

Q. When you constrict or decrease the area in a flue pipe, do you increase or decrease the draft through that pipe?      A. I don't change it at all.

Q. In other words, if you have a smaller neck, for example, than the rest of the radiator, you will have the same draft through that radiator as if you had no constriction?

A. Draft is a theoretical term. Draft relates to the available head—a pressure difference that might exist. It relates to the difference in the weight of the column of air on the outside as compared with the weight of the column of gas or air on the inside. It is a theoretical term. The small tube would restrict flow because of the frictional resistance that it would produce; but it would have no relation to the term “draft” in itself.

Q. All right. Leaving out the word “draft,” then would the flow be greater or less with this restriction?

A. With an equal energy source available to produce that flow, there would be less with a greater restriction, obviously.

Q. Then actually do not these necks here control the flow in the rest of this radiator?

A. To a large degree they have a very import-

(Testimony of John H. Hollingsworth.)

ant bearing on the flow in the first radiator. That is their design function; one of their design functions.

Q. Now, are not these pipes smaller in Exhibit 20-B than what you called the second radiator in Exhibit 20-A, which is Plaintiff's—which you stated was the Plaintiff's manufactured [122] device?

A. You mean smaller in cross-sectional area?

Q. That is right.

A. Yes. I think they are somewhat smaller.

Q. Therefore, wouldn't these two pipes control the draft in this whole thing over and above what the effect of this upper draft flue would be?

A. No, sir, not in the whole thing.

Q. How can you get more through here than these allow to go through them?

The Court: "Through here," you are referring to the pipes in Exhibit 20-A?

The Witness: Would you rephrase that. I don't understand that question.

Q. (By Mr. Lyon): How can you, by increasing the size in the second radiator, force a greater draft when you constricted it already?

A. Force a greater draft? I still don't understand.

Q. Well, didn't these two pipes control the draft or the flow through both radiators?

A. No, sir; through the first radiator only.

Q. Then how will the second one have any effect on the first radiator? A. It doesn't.

Q. Now, I will ask you about the defendant's

(Testimony of John H. Hollingsworth.)

device. [123] On Exhibit 24 you have here a part that you have marked "wax." Is that part of the radiator in that device?

A. No, I would say that it would perform the same design function and could be described in the same manner as the tubes in Exhibit 20.

Q. And that is smaller in size and cross-sectional area than in the second radiator which is shown in either Exhibit 24-B or 25-A?

A. Yes.

Q. Now, when you have described what you have called the horizontal cross-section—the measurements were made here of these Exhibits 20, 24 and 25—you were describing the average section of the first radiator in these devices, minus the upper pipe?

A. Yes.

Q. Now, I would ask you, as the inventor of the patent in suit, to show me anywhere in this patent that it says a "mean area."

A. It doesn't say a "mean area."

Q. It just says any cross-sectional area, doesn't it?

A. I don't believe it says that.

Q. Well, will you please explain where it says anything else?

The Witness: May I have a copy of the patent?

Mr. Lyon: If your Honor please, at this time while he [124] is looking for the answer——

The Court: The claims speak for themselves—refer to a horizontal cross-section.

Mr. Lyon: Yes, but doesn't say what horizontal——

(Testimony of John H. Hollingsworth.)

The Court: It speaks for itself. We don't have to have the witness go into it.

Mr. Lyon: Maybe he can find a statement in the patent.

The Court: If he can, we can, too.

Mr. Lyon: Well, I think he is going to try to interpret some language, and I want to know what the interpretation is.

The Court: Very well.

Mr. Lyon: If your Honor please, this brings us back to the matter of these admissions. I think your Honor has heard the testimony and you know why I am now willing to admit the admissions as they stand, because even with the admissions on the record, I do not believe that they mean anything. I believe it's still the court's province to interpret whether that is the meaning of this patent in suit or if that language, even if it is admitted to be present, has any meaning at all.

The Court: In other words, you are willing to deem the requests all admitted?

Mr. Lyon: All except the one as to whether their device is built in accordance with the patent in suit. That general statement, why, I'd refuse to admit that.

The Court: That's the admission that refers to the invention? [125]

Mr. Lyon: It is admission No.—

The Court: 14.

Mr. Lyon: I believe so. That is the one where

(Testimony of John H. Hollingsworth.)

they ask is their Narrowall heater built in accordance——

The Court: Request No. 14. "That the wall heaters manufactured and sold by the plaintiff and designated as the 'NarrowWall' embody the invention described and claimed in the patent in suit."

Mr. Lyon: That is exactly right. That is the one that I had in mind. Well, all of these are pure conclusions.

The Court: It would embody any invention claimed in the patent in suit. There is an admission as to that, is there not?

Mr. Lyon: No, because my point is that the claim of this patent in suit is entirely invalid for lack of definiteness. And I point——

The Court: But the request is two-fold. The invention is described—that assumes the fact that any inventions are described——

Mr. Lyon: That is my point; that there are none described.

The Court: But there is this described and claimed——

Mr. Lyon: That is what I mean, none described——

The Court: ——which under the rule would require you to read that as "described or claimed," wouldn't it?

Mr. Lyon: Well, I state—— [126]

The Court: Aren't there any inventions claimed in the patent?



(Testimony of John H. Hollingsworth.)

Mr. Lyon: That is my contention, that there is no invention either described or claimed.

The Court: I have your point.

Mr. Lyon: The very indefiniteness of the claim in suit.

The Court: Now, is there a question pending?

Mr. Lyon: Yes. I have asked this witness wherein is the description of the term cross-section or where it is supposed to be taken from.

The Witness: In the patent specifications, I believe it is called, I refer to it in this manner: "In the heater just described——"

Mr. Lyon: Would you give us the page number and the line number?

The Witness: Yes. That's page 3, line 29.

"In the heater just described the horizontal cross-section of the second radiator is considerably smaller than that of the first, and is designed so that a normal draft with a very short flue will barely cause air to be drawn into the system through the draft hood and so that increase in chimney effect does not increase dilution through the draft hood to a substantial degree." [127]

I then attempt to discuss draft. In the paragraphs immediately following, to describe or to amplify the statement I have just read——

Q. (By Mr. Lyon): You have finished your answer?

A. No, sir. At the bottom of page 3, line 75, and continuing on for two paragraphs, I have discussed the effect of the constricted area on the frictional

(Testimony of John H. Hollingsworth.)

resistance to flow and why that produces the result——

Q. Is that at the bottom of column 6?

A. I beg your pardon?

Q. I haven't been able to find out where you are referring to. Is that the bottom of column 6 or—

A. Page 3 at the bottom of the page, left-hand side, "Frictional resistance to laminar flow is essentially proportional to the velocity of such flow." And so forth.

Q. Well, that is the bottom of column 3.

A. Column 3, excuse me.

Q. There are no page numbers.

A. All right. Column 3. [128]

Beginning with that paragraph I have attempted to describe why restricting the cross-sectional area produces the results that are described in the patent with reference to flow through the second radiator.

Q. But that doesn't describe any particular area, does it?

A. I believe to anyone that has practiced in the art it most certainly does.

Q. Well, every time you put a constriction in those radiators anywhere you are going to alter the draft according to that statement, aren't you?

A. Oh, yes.

Q. Then these pipes in Exhibit 20-B, in this neck in Exhibit 24, are going to constrict the draft, slow it up, are they not?

A. Yes.

Q. And they are a great deal smaller in cross-

(Testimony of John H. Hollingsworth.)

sectional area than the area of the second radiator?

A. Yes; but I don't see where that has any bearing on the first radiator's cross-sectional area.

Q. Now, taking, for example, Defendant's Exhibit 24, I will draw a line which I am going to label with a big "C" here and an arrow pointing to it; now, could you not take a cross-sectional area right across that point? A. Yes. [129]

Q. Within the meaning of the horizontal cross-section? A. Yes.

Q. Is that the same horizontal cross-section area as, for example, through where I make the line "D"?

A. It may or may not be.

Q. Do you know?

A. I would have to measure it to know.

Q. You haven't measured it?

A. Obviously not exactly in the plane that you have drawn those lines.

Q. Then you don't know whether either C or D are bigger or smaller than the cross-sectional area in the second radiator in Exhibit 24-B, do you?

A. I don't know that definitely, no. I know, however, when I speak in terms of the area of the first radiator being practiced in the art, that I am speaking of the cross-sectional area basically in the plane of the combustion zone of the gases.

Q. But your definition excludes anything like the necks and pipes?

A. Oh, yes.

Q. They are not part of this radiator and have no effect on it, according to you, then?

(Testimony of John H. Hollingsworth.)

A. I didn't say that. I said they had an effect on it, very definite effect on it, and they are a physical part [130] of it; but they are not a functional part of the radiator in the sense that the trade would define the first radiator.

Q. I don't want the trade's terms; I want the actual facts of what happens. The minute you put those constrictions in there, in the necks, or those tubes in Exhibit 20-B or 24, then the cross-sectional area through that radiator, at least at one point, is a great deal smaller, is it not, than the cross-sectional area in the second radiators?

A. Through one part of that physical radiator, that's right.

Q. When you have a flow of gases up through these radiators, they act the same as if they were fluids, do they not? The same rules——

A. The same rules of fluid mechanics apply to both over a large range, yes.

Q. And when you put a bottle-neck in any type of conduit for a fluid, is not that bottle-neck the control as to the flow of the fluid in the entire system?

A. It is a partial control. It can be the major control. But it is not the whole or complete control, no.

Q. But you would get no more draft in the lower part of one of these radiators than you could get through the flue here at the neck, could you?

A. Again, I would prefer to get away from the word "draft" if you don't mind, because "draft" is

(Testimony of John H. Hollingsworth.)

a rather theoretical [131] term. By "draft" do you mean the rate of flow?

Q. Well, then, maybe we had better find out what you mean by "draft." The patent here uses the term "draft."

The Court: By your question you mean flow, flow of air?

Mr. Lyon: No. I want to know what he means by the word "draft." That they control the draft by having a smaller——

The Court: You are abandoning the question you have pending now?

Mr. Lyon: I want to know what you mean by the word "draft," if you are going to qualify your answer.

The Witness: I will read it from the patent. Column 3:

"Draft is what tends to make gas move upward through a flue and is the result of a pressure differential, that is, the difference in the density of the column of gas in the flue and a like column of equal height outside. Hence theoretically available draft is a function of flue height and flue temperature. Although the theoretically available draft is a measure of static condition and is never fully obtained due to frictional losses in the flue, the actual draft at any flue temperature is still closely related to the flue height and any increase in that height will cause the flow of gas to increase until the total energy loss of the system equals [132] the theoretically available draft."



(Testimony of John H. Hollingsworth.)

Q. (By Mr. Lyon): Now, can you answer the question of whether this neck or these tubes control the draft in either of these two devices?

A. I think in view of what I have just read, that I am still entitled to ask that we get away from the word "draft." I would prefer to talk about the rate of flow, if that is what you are referring to.

Q. You can't answer that question, then, can you?

A. Not until it is more clearly defined, so that I may more thoroughly understand what your question is.

Mr. Lyon: If your Honor please, I would like the witness to be instructed to answer. He has defined each term himself.

The Court: He says he doesn't understand your question. Ask him what he doesn't understand about it.

Q. (By Mr. Lyon): What don't you understand about the question?

A. You speak of draft. Draft is a measure of available energy, and if you are speaking of draft only in terms of a measure of available energy, then I can answer that the tube does not affect—the cross-sectional area of the tube does not affect that available energy; but I don't believe that that is what you were intending by the question.

If your question—rephrasing it in my own words—if your question is this, if you are asking me if a change in [133] the cross-sectional area of the tube at the top of the radiator affects the flow of flue

(Testimony of John H. Hollingsworth.)

gases through the radiator, the rate of flow of flue gases through the radiator, then I can answer yes it does.

Q. Then does the size of the second radiator, in other words, the available area through which the gases have that size, and the area of the section in the first radiator, have any influence on the draft?

Pardon me.

Does the differential in the area between the second radiator and the first radiator have any influence on draft?

A. Speaking of draft in its strictest sense as available energy, no.

The Court: Speaking of it in the sense of flow, what would your answer be?

The Witness: Speaking of it in the sense of flow, the relationship between the second radiator and the first radiator would have an effect on the rate of flow through the second radiator in this respect: The second radiator is defined as being smaller than the first radiator—well, it is difficult to answer. The area of the first radiator, cross-sectional area of the first radiator, is related to a great degree to the amount of gas that the appliance is designed to burn. And using that as a reference point, then if the area of the second radiator is changed with relation to the [134] area of the first radiator, I can affect the rate of flow through the second radiator, yes, in the terms of the patent, if I make myself clear, in the terms of the functions that I am trying

(Testimony of John H. Hollingsworth.)

to create, the operation that I am trying to create as I have described in the patent.

Q. (By Mr. Lyon): All right. The rate of flow—when you put the neck or the tubes in there, doesn't that have a similar effect to the change in area up in the second radiator?

A. It has that effect on the lower radiator, yes. It is necessary—rather, not completely necessary, but it is a desirable design means of controlling the rate of flow through the first radiator.

Q. Isn't it a fact that that was all old and well-known long before you ever went into the stove business or heater business?

A. What fact, Mr. Lyon?

Q. That to decrease the area anywhere along a flue would slow down the flow through the flue?

A. Oh, yes, any fluid mechanics book would teach me that.

Q. And it can be accomplished by putting a neck at the top of the first radiator, or putting it up into the second—or by making the second radiator smaller, can it not? [135]

A. By making the neck at the top of the first radiator smaller I can produce control over the flow through the first radiator, yes. By controlling the cross-sectional area of the second radiator I can control the rate of flow through the second radiator, yes.

Q. Well, now, you are playing on words. Unless you change the diameter some place or the cross-sectional area some place in the second radiator, you

(Testimony of John H. Hollingsworth.)

are not altering the flow once it enters in the bottom, are you? The second radiator does not control the flow through itself?

A. To a large degree it does, yes.

Q. Well, where is your control if you don't change the diameter in any part?

A. By the proper selection of the cross-sectional area with relation to the known volume that I want to put through that.

Q. But you have already determined that by the neck here?

A. No, I haven't; no, I haven't, because——

The Court: By "neck here," you are referring to the neck——

Mr. Lyon: The neck or the pipes of either exhibit.

The Court: Of the first heater?

Mr. Lyon: Yes.

The Court: The lower heater. [136]

The Witness: I think it should be understood that part of the flow through that second radiator, an important part of the flow in appliances, other than those built according to this patent, is that flow that enters through the relief opening of the draft hood. It is that flow, chiefly, that we are trying to control by the cross-sectional area—by the proper selection of cross-sectional area of the second radiator in its relationship to the area of the first radiator.

Q. (By Mr. Lyon): But the neck controls the flow, does it not?

(Testimony of John H. Hollingsworth.)

A. The neck has a partial control over the rate of flow through the first radiator, the neck of the first radiator has partial control over the rate of flow in the first radiator.

Q. What is the purpose and reason for using this device 20-A on top of Exhibit 20-B?

A. The purpose is many fold. I think it is pretty well defined in the patent. Chiefly its purpose is to control appliance efficiency and wall temperatures above the lower section of the appliance.

Q. Well, that is one purpose. Will you define for us now what heater efficiency is?

A. Heater efficiency?

Q. Yes.

A. Heater efficiency is the ratio of heat input to heat [137] output.

Q. And how do you arrive at that ratio on one of these heaters?

A. By well-established test procedures which determine the flue loss of the appliance as compared to its rated input.

Q. Would you explain the method of doing that to us?

A. The temperature of the flue gases in the vent pipe are determined, the average temperature——

Q. (By Mr. Lyon): Now, take Exhibit 20-B——

Mr. Christie: Have you finished your answer?

Q. (By Mr. Lyon): If you don't mind my interrupting, let's give an example of how you would get it on Exhibit 20-B and 20-A, a physical demonstration of how you would get heater efficiency.



(Testimony of John H. Hollingsworth.)

A. If I were referring to that, I would, first of all, like to say this: that I would describe it in the manner of the procedure that is used by the American Gas Association testing laboratories, because that is the one most well recognized.

Q. That is just what I would like to have you do.

A. That procedure in its present form is somewhat different from what it used to be. That procedure has been changed because of what we have determined from the development of this appliance. But the procedure that was used at the time that this Holly appliance was approved by the American Gas [138] Association is this: The appliance is installed in a wall structure which simulates the installation conditions in the field, approximately; to the top of the appliance, which in this instance would be the uppermost portion of Exhibit 20-A,—

The Court: That is the second radiator?

The Witness: Which is the second radiator, is attached a four-foot section of standard flue pipe, for which this is adapted to receive. Flue temperature readings are taken in the flue pipe. By flue temperature readings I am speaking now of an average of several thermocouple readings in a horizontal plane across the flue pipe, at the same time—

Q. (By Mr. Lyon): Whereabouts are those taken, what horizontal plane in the flue pipe?

A. They are taken at a plane three feet above the appliance outlet, as I recall. Further than that, I might add that the flue pipe is insulated to reduce any flue loss that might exist in that three-foot

(Testimony of John H. Hollingsworth.)

section of flue pipe to a minimum. In addition to the flue temperature a carbon dioxide content measurement is made of the flue gases. And from these two measurements we can determine the total heat content of the flue products and, thereby knowing the total heat input to the appliance we can determine its efficiency.

The Court: How do you know the total input?

The Witness: The total input is part of the approval. It has to be defined, to begin with. [139]

The Court: You start with that, you take that from the burner, do you?

The Witness: Yes.

This, for example, your Honor, is a 35,000 B.T.U.-per-hour appliance.

The Court: The burner that is in the first radiator has a B.T.U. rating, does it?

The Witness: Yes, it does.

The Court: And you start with that, and the other measurement is relative to that?

The Witness: Yes, your Honor.

The Court: Do you consider as loss the heat that goes out the flue, is that it?

The Witness: Yes.

The Court: That is the loss energy?

The Witness: Yes.

The Court: The difference between the input and the loss—the loss deducted from the input gives you the output, is that it?

The Witness: That is correct.

(Testimony of John H. Hollingsworth.)

Q. (By Mr. Lyon): That is the heater efficiency, that difference?

A. Well, the ratio of those differences is the heater efficiency, yes.

Q. Now, in getting the input you have to accurately [140] account for the volume of gas being burned and its B.T.U. content, as well, do you not?

A. Yes.

Q. That is very carefully controlled during one of these tests? A. Yes.

Q. And if there is any variation in that input of gas, not only as to rate, but as to B.T.U. content of gas itself, it would throw all the figures off, would it not?

A. Not necessarily all of them. It would depend on the figures that you were concerned with. Some of them would affect—— [141]

Q. I mean in figuring your——

A. Flue loss?

Q. In figuring your efficiency. If you had any real variance in the contents of the gas or its volume.

The Court: You mean by that if the heater didn't measure up to its rated capacity of input?

Mr. Lyon: That is right.

The Witness: That has some effect, but not very serious effect on efficiency. However——

Q. (By Mr. Lyon): Now, what is the minimum efficiency that the A.G.A. will approve for one of these heaters? A. 70 per cent.

Q. Now, if the temperature coming out of one

(Testimony of John H. Hollingsworth.)  
of these secondary radiators exceeds certain degrees, the higher it goes the higher the efficiency, is that not right?

A. It depends on the CO<sub>2</sub> content of the flue product.

Q. Then the heat in the secondary radiator doesn't amount to anything, only the CO<sub>2</sub>—

A. I didn't say that. But I say that it is the measurement of the two, both the flue temperature and the carbon dioxide content that is a measure of the flue loss.

Q. Will the CO<sub>2</sub> content through this flue vary as long as the burner is running at a set rate?

A. If the burner is running at a set rate and no other conditions are changed, it will remain at the constant. [142]

Q. Assuming that the conditions remain the same, the higher the temperature—the outlet of this secondary or this second radiator—the lower the efficiency, is that not true?

A. Generally speaking, that is true. However, that is not always the case. But because you have changed one of the conditions—

Q. What condition have I changed?

A. You have changed the available draft which will change the rate of dilution of the flue products through the draft hood relief opening. It can change the gas-air mixture ratio to some extent in the first radiator.

Q. Now, the only way you could do that is by

(Testimony of John H. Hollingsworth.)

intentionally putting a plug through some of these passages, opening them wider or——

A. The only way I could change the flue temperature?

Q. No. To change these drafts you are speaking about.

A. By changing the temperature of the gas, I change the drafts.

The Court: As I understand it, you take the temperature in the flue and that's the waste, loss of energy—represents the loss of energy.

The Witness: Total heat content of the flue is the waste energy loss.

The Court: So if that is more than 30 per cent of the [143] input——

The Witness: Then I cannot——

The Court: ——it is below the rated minimum, rated efficiency.

What does the carbon dioxide measure have to do with that?

The Witness: The carbon dioxide measurement enables me to determine the mixtures that I have within the flue.

The Court: In determining the efficiency, you have so many B.T.U. units coming from the heater, theoretically——

The Witness: Yes.

The Court: ——and so many of those are going out the flue——

The Witness: Yes.

The Court: ——being wasted.

The Witness: Yes, sir.



(Testimony of John H. Hollingsworth.)

The Court: Now, the difference between those two would determine the output of the heat.

The Witness: Yes.

The Court: Well, what do you do with this CO<sub>2</sub> measurement? How does that figure in the computation?

The Witness: The manner in which I determine the total heat content of the gases going out of the flue is this: If I know the composition of the flue gases and the temperature of the flue gases, and knowing the specific heats of each one of the components, I can determine the total heat content.[144]

The Court: In other words, that's the method of computing the B.T.U.s that are going out the flue?

The Witness: Yes. And the CO<sub>2</sub> measurement enables me to determine the content, the mixture of the flue gases. It is a measurement, chiefly, of the amount of excess air over and above that needed for combustion that is in the flue.

Q. (By Mr. Lyon): It also helps in determining whether all your gas was actually burnt, too, doesn't it?      A. Yes.

Q. Because in all of these there is some gas that doesn't get burnt, some of the available B.T.U.s in the gas?

A. That's unlikely because in addition to these tests for efficiency, there are also tests for carbon monoxide content, and if combustion was incomplete, normally the appliance would not pass the test.

(Testimony of John H. Hollingsworth.)

However, you are correct, that it is a measure of completeness of combustion.

Q. Now, Mr. Hollingsworth, isn't the purpose, the main purpose of this secondary heat exchanger, Exhibit 20-A, to enable you to burn a larger volume of gas in the lower radiator than you could if you only had an ordinary pipe on it, ordinary flue pipe on top of the first radiator?

A. No. That's—would be completely a secondary function. That would be a minor objective.

Q. Could you operate Exhibit 20-B with an ordinary flue [145] pipe on it at its rated output of 35,000 B.T.U.?

A. No.

Q. Why not?

A. Because there are some obvious—some heat transfer, an appreciable amount of heat transfer that takes place in the second radiator, in the secondary heat exchanger, Exhibit 20-A.

The Court: But that doesn't answer the question, does it? The question is why not. You say it can't be operated, as I understand. The question is why can't it. Why isn't it possible to operate?

The Witness: Oh, well, in the first place it wouldn't—it would no longer be A.G.A. approved.

Q. (By Mr. Lyon): Why wouldn't it get A.G.A. approval then?

A. Well, because—

The Court: We aren't referring to desirability. As I understand, the question was referring to possibility. You say it is impossible to operate, as I understand you.

(Testimony of John H. Hollingsworth.)

Mr. Lyon: I will amend the question, your Honor, to say this: It would be impossible to use it under A.G.A. rules; which the witness, I think, will affirm with me, none of these heaters can be operated without that approval.

The Witness: That was my understanding of your question. [146]

Mr. Lyon: So when we say "impossible"—

The Court: That means impracticable.

Mr. Lyon: Well, all right. It might burn a house up.

The Court: That is what I was getting at. Isn't that the objection? If you operate it with an ordinary flue pipe with that input, it would concentrate too much heater in a small space.

The Witness: Yes, sir, and I have seen that in my own experience, where an installer has neglected to attach a secondary heat exchanger to one of these devices and there has been a serious consequence in terms of fire hazard.

Mr. Lyon: And that is because the temperature in the flue gets too high, is it not?

The Witness: It is because the wall is no longer protected from the flue temperatures. The normal flue pipe is not designed to provide air circulation through an annulus surrounding it in the manner that the secondary heat exchanger is designed.

Q. (By Mr. Lyon): That's because it gets too hot, isn't that it?

A. The walls get too hot.

Q. How about the flue? What gets the walls hot?

(Testimony of John H. Hollingsworth.)

A. The temperature of the flue pipe.

Q. Then it is the flue pipe that gets too hot for safety, is that not true? [147]      A. Oh, yes.

Q. Now, therefore, you put a cooling means around this flue, did you not, to reduce the temperature in that flue?      A. Yes.

Q. Keep it cool.

A. If you wish to refer to the second radiator as a flue, yes.

Q. It isn't anything else but a ventilated flue stack?

A. In a sense it is. However, it is not considered that. And the American Gas Association would not allow us to call it that. It is a very definite part of the appliance, because it performs a part of the overall function of the appliance.

Q. What is a ventilated flue stack, please?

A. A ventilated flue——

Q. Stack.      A. ——stack?

Q. Yes.

A. I would assume you were referring to what we term double wall metal vent, which has an inner and outer jacket and is ventilated in such a manner that it protects the wall surfaces.

Q. At the time you designed this secondary heat exchanger, weren't there several ventilated flue stacks on the market? [148]

A. Yes, sir. There had been one in particular for a long period of time.

Q. Would you name what that was?

A. What was termed the Payne "A" vent.

(Testimony of John H. Hollingsworth.)

Q. How about Metalbestos, the line of Metalbestos?

A. That had been on the market for a short period of time.

Q. Could you describe the construction of one of those? Take the Metalbestos, for instance.

A. Yes. The Metalbestos type B vent, as we would call it, has an inner section, a first flue pipe I suppose it could be called, which actually confines the flue products; and an outer jacket spaced away from that flue pipe.

Mr. Lyon: Maybe this will save you time. I will hand the witness a document which I ask be marked as Defendant's exhibit next in order.

The Court: Has it been heretofore marked?

Mr. Lyon: No, your Honor.

The Court: It will be Defendant's Exhibit F.

Mr. Lyon: The plaintiffs have seen the exhibit. I have provided them with a copy.

No, it would be way down the line.

The Court: You mean mark it following the group heretofore marked?

Mr. Lyon: I have a list of exhibits here, your Honor. It would be Exhibit T—should be. [149]

The Court: It will be so marked; Defendant's Exhibit T for identification.

(The document referred to was marked as Defendant's Exhibit T for identification.)

Q. (By Mr. Lyon): Now, does this Exhibit T refer to the device known as the Metalbestos that you referred to?      A. Yes, it does.



(Testimony of John H. Hollingsworth.)

Q. And that Exhibit T describes a ventilated flue stack, does it not? A. Yes, it does.

Q. And you were familiar with those when you made the alleged invention in suit?

A. Oh, yes.

Q. Now, would you point out to the court how that device works, and its purpose?

A. Its purpose is to keep the walls cool. It works in this manner: This picture, which is a line drawing and would illustrate the heater mounted in the stud space of a wall—this being the top of the wall or the plate line as we would call it——

Q. That is the attic line?

A. The stud spaces left open at the point of entrance into the attic. The pipe is so designed that the inner section carries the flue products; the outer section, which is a jacket, encloses the inner pipe, provides an annulus between [150] the inner and outer; air is drawn down through the stud space and into holes provided at the base of the outer jacket, up between the inner flue pipe and the jacket, and out again.

Q. Into the attic or outdoors?

A. Either into the attic or outdoors. I believe, as it is illustrated here, it would be outdoors.

Q. Now, under the various codes, this plate line that you have referred to here at the top, which you set open, in many cities or counties or states, they require that to be sealed, do they not, for fire hazard; specifically Los Angeles and Los Angeles County?

(Testimony of John H. Hollingsworth.)

A. Not with this type of vent. This type of vent is UL approved, with normally what we call a ventilated plate spacer. The operation of this type of vent, of necessity, requires of circulation of air down through that space.

Q. But do we not have to specifically here provide a seal here for what is known as the fire wall break?      A. No.

Q. No?      A. No.

Q. Do they do that in some places?

A. Yes; but not with this flue pipe.

Q. And you have never seen it in operation then as shown on the opposite page to which you have been pointing, where it is shown—I will mark it with an “A” and an arrow, [151] where it refers to the plate as being sealed and a vent placed in it.

A. I have never seen one operating like that, no. I don’t believe this shows the plate being sealed.

Q. Well, it refers to it being there in the literature.

A. I have seen devices like this drill used, but not in this particular application.

Mr. Lyon: I will offer this as defendant’s exhibit next in order in evidence.

The Court: Exhibit T for identification. Is there an objection?

Mr. Christie: No objection.

The Court: It may be received in evidence.

(The document referred to was received in evidence and marked as Defendant’s Exhibit T.)      [See Book of Exhibits.]

(Testimony of John H. Hollingsworth.)

Q. (By Mr. Lyon): Now, Mr. Hollingsworth,—

Mr. Lyon: I would like Exhibit 21, please, if I may have it, Mr. Clerk.

(Whereupon Exhibit 21 was handed to counsel by the clerk.)

Q. (By Mr. Lyon): Now, Mr. Hollingsworth, on Exhibit 21 you have indicated a Holly heater, have you not? A. Yes.

Q. And you have described that the air to operate the [152] secondary heater exchanger—in other words, the air that passes through the annulus to cool the vents enters that annulus by the path marked by the blue arrows on that chart, have you not? A. Yes.

Q. And that air all enters the annulus of the secondary heat exchanger, such as Exhibit 20-A, from between the wall, or the wall studs and the back or the sides of the lower heater, Exhibit 20-B, does it not? A. Yes.

Q. No other air enters that annulus?

A. No.

Q. Now, if this back space between the lower heater box and the wall, or the studs, was blocked, what would the effect be on the efficiency of the Holly heater?

A. The efficiency would be slightly reduced. There would be other effects that would be much more serious; wall temperatures would be bad.

Q. Would the wall temperatures go way higher?

A. Oh, yes, I believe so; because you would no

(Testimony of John H. Hollingsworth.)

longer have the air circulating in this device that is provided to keep the walls cool.

Q. In other words, this air coming up the back here is used to cool the walls?

A. That is the primary function, yes. [153]

Q. Now, you state that you have made tests on the defendant's exhibits, Exhibits 24 and 25, and you have stated that the air for the operation in the annulus of the economizers, Exhibits 24-B and 25-A comes from between the walls and the heater, and you have so indicated that on Exhibit 21 by the blue arrows, have you not? A. Yes.

Q. Now, why didn't you show that air enters at the point on Exhibit 21 that I am going to make by a pencil mark and an X (indicating)?

A. It is shown with these green arrows, and it was described in the testimony.

Q. You did not describe it as entering the annulus, did you?

A. I believe I did. However, I am only going on recollection. If it enters there, it is implied. That is the only place——

Q. Does it enter the annulus? A. Oh, yes.

Q. Now, does not the air entering at the point I have marked X, which is the open grille that I will now point out to the court on Exhibit 24-A, as as indicated by the Nos. 7 and 8, doesn't the point X refer to these two grille openings? A. Yes.

Q. Now, doesn't that air do the cooling of the second [154] radiator of the defendant's device?

A. Well, to whatever extent air is drawn in there

(Testimony of John H. Hollingsworth.)

and goes up to the annulus, yes, that contributes to the cooling.

Q. Will the efficiency of the defendant's device go up or down if the wall space is plugged so that no air can come at all, can come up the back and into the secondary heater?

A. I haven't tested it. I wouldn't know. I would assume on particularly the 4-foot economizer that it would. I say that because the 4-foot economizer is the one which draws a very substantial and large percentage of its air into the economizer from out behind the box. [155]

Q. Have you ever measured the volume that went through any of the defendant's economizers, the volume of air?

A. The volume?

Q. Yes. A. Of air?

Q. Yes. A. No, not by volume.

Q. Then how do you know what comes out of here, out of the secondary—strike that.

Then how do you know what volume of air comes out of the economizer?

A. By observing tests that Landsberg ran with a tracer gas and a detector.

Q. And that is the only way you know?

A. That is the only way that I know quantitatively. I know qualitatively by many tests, and by being thoroughly familiar with this art, that there is a very substantial amount.

Q. How did you measure that amount? You say you never measured it. How do you know it?

A. By the tests that Mr. Landsberg ran I know



(Testimony of John H. Hollingsworth.)

it quantitatively. By the tests that I ran I know it qualitatively.

Q. Will you give us the tests that you ran?

A. Yes. I ran tests with a wall structure which was [156] glass-backed behind the first box so that I could observe the space between the first box and the wall; and I have run smoke up through that section, and I know that there is a substantial movement of air up around the back of the first box into the economizer.

The Court: You made a test to determine relatively how much enters from the front, the vent on the front?

The Witness: I did not run those tests personally, your Honor. Mr. Landsberg ran those with a tracing gas.

The Court: The vent on the front that I refer to would be Exhibit 24-A, would it not?

The Witness: Yes.

Mr. Lyon: Yes, your Honor.

If your Honor please, I would like this witness to confine himself to tests that he made, rather than Mr. Landsberg, because I understand Mr. Landsberg is going to be here and there is no use cross-examining both gentlemen as to what he did.

The Court: Very well.

Mr. Lyon: So I am asking this witness to confine himself to the tests that he made to determine that there was any air coming out of the economizer upper grille.

(Testimony of John H. Hollingsworth.)

The Witness: Determine if any air came out of there?

Q. (By Mr. Lyon): That's right. Did you ever make a determination? [157]

A. Sure, there is air coming out there.

Q. How do you know?

A. I have watched it carry smoke particles.

Q. How did you insert those smoke particles?

A. I inserted them at the base of the heater and watched the smoke flow up the back of the heater and into the economizer and out the grille.

Q. Will you explain to us where you inserted the smoke?

A. In many spots at the base of the heater.

Q. If I insert smoke in here, it is going to come out the top of the economizer, isn't it?

A. Yes.

The Court: Insert it in the front or the back?

The Witness: In both spots, your Honor.

Q. (By Mr. Lyon): Whereabouts now, will you please refer to Exhibit 24, or any of these exhibits, and show us where you inserted the smoke that you say you saw come out of the economizer?

A. I inserted smoke at the floor level immediately in front of the entrance opening provided at the base of the panel Exhibit 24-A. I further explored with smoke the whole lower area at the base of the heater with smoke—

Q. Will you point to the position and tell us right where you put the smoke, not just some area?

A. I put the smoke in many areas. I put the

(Testimony of John H. Hollingsworth.)

smoke in almost every area at the base of the heater along the floor level on which the heater rests, and observed smoke in varying degrees, depending on where I placed the wand, coming up behind the heater and going up into the economizer and out the grille.

I also placed smoke at the sides of the heater and observed the same thing.

I, further, to confirm again what I was observing, I placed smoke wands slightly above the bottom of the lower box, between the box and the wall, so that I knew that it was directly in the conduit that was provided there. And I further observed smoke traveling upward behind the box and into the economizer and out the grille.

Q. And all that smoke went up through the economizer?

A. Not necessarily. Some of it goes through the ventilated header plate, which is at the base of Exhibit 24-B, ventilation being provided by these holes on the header plate. That smoke went up into the stud space and into the attic.

Q. Now, how much of that smoke went up the attic and how much came out of the economizer?

A. I never measured that.

Q. You don't know whether that is half, a tenth, or five per cent?

A. Of the total smoke that was coming up behind the [159] first box?

Q. That you inserted into the machine.

A. No, I don't know qualitatively how much it

(Testimony of John H. Hollingsworth.)

was. I know approximately, by observation, that it was smaller portion of the smoke that was coming up behind the first box.

Q. Have you ever measured the rate of flow up behind the first box?

A. No, because that would be almost impossible to do accurately.

Q. Have you ever estimated it?

A. Estimated the rate of flow?

Q. Yes.           A. Yes.

Q. What was your estimate?

A. In terms of—

Q. Cubic feet per minute?

A. I don't recall. I would have to look into my test records to find that.

Q. Would you do that for us before tomorrow?

A. Sure.

Q. It is important that we have that answer.

Isn't it a fact, Mr. Hollingsworth, that the air around the back and sides of the defendant's structure does not go where you have directed with these crooked blue arrows, but the majority of it passes straight up behind both the heater [160] and the economizer and into the attic?

A. No. First of all, I think we have to differentiate between the three-foot and four-foot economizer as to the degree of which it goes into the attic. One has a ventilated header plate, and the other has essentially a sealed header plate. Which one would you want me to talk about?

Q. You talk about either one of them. You dis-

(Testimony of John H. Hollingsworth.)

tinguish. I asked you the question, doesn't the air go up, and you have left that out entirely from this drawing, the flow of air up the back and out into the attic, have you not?           A. Yes.

Q. And that has no effect on the operation of these heaters?

A. It has very little. It is a very minor effect.

Q. There would be——

A. It provides a little additional cooling up in the wall structure area, yes. That is the reason it is used. That is why a ventilated header plate is used. It helps to keep the temperatures down in the confined stud space.

Q. But——

A. But in terms of the basic operation of the heater and the air flow through it, and the gas flow through it, it is not particularly significant.

Q. Then is it also your testimony that the air entering the economizer through the opening X is insignificant? [161]

A. No. That is not insignificant, not at all.

The Court: Then opening X through the front——

Mr. Lyon: Opening 7 and 8 on Exhibit 24-A.

The Court: That is from the front side?

Mr. Lyon: That is intermediate level in front into the economizer.

The Court: On the front side of the lower radiator?

Mr. Lyon: On the front side at the top of the lower radiator.

The Court: Yes.



(Testimony of John H. Hollingsworth.)

Mr. Lyon: That's right.

Could you answer the question? I didn't hear it.

Did he answer it, your Honor?

The Court: I understood there was an answer.  
Is there a pending question, Mr. Reporter?

(The following question and answer were  
read by the reporter:

"Q. Then is it also your testimony that the air entering the economizer through the opening X is insignificant?

"A. No. That is not insignificant, not at all.")

Mr. Lyon: Thank you.

Q. (By Mr. Lyon): Now, are you sure that you have yet told us all of the major operations of this heater? [162]

A. Major operations of the heater?

Q. Yes.

A. To the best of my knowledge I have, yes.

Q. All right. I call your attention to Exhibit 24-A, and upon that exhibit is a mark "10" and above that is a small grille.

A. Yes.

Q. Have you described the operation of that outlet or inlet, whatever it is?

A. No.

Q. That has no operation, no function in this heater?

A. The function of that grille, as I understand it, as I would interpret it, is to allow some air to bleed off and escape, which is coming up in the

(Testimony of John H. Hollingsworth.)

space between the box and the side of the panel, which further protects the walls.

Q. Isn't it a fact that that is also a bleed-out that is used by the defendant to get rid of the hot air coming—any possible hot air coming up outside of the box between the wall and the studs?

A. I wouldn't believe so, no.

Q. Now, when you make a smoke test, haven't you seen heavy smoke, when you put it in the back, between the wall and the back of the box, haven't you seen heavy smoke coming out at 10?

A. No, I don't recall having observed heavy smoke coming [163] out of 10, not at all. I have observed smoke coming out of 10, yes. But in the manner in which you have asked the question, I would have to answer no.

Q. When you put the smoke in at the back of the lower box between the wall and the box, does not smoke come out into the attic, for one place, and a very heavy amount, and also out of these openings 10 on each side of Exhibit 24-A?

A. When I placed the wand between the back of the box and the wall on the four-foot economizer, I could always observe smoke coming out in the space that goes into the attic, depending on where I might put the wand I could see smoke coming out of those side louvres on Exhibit—

The Court: The question, as I understand it, is when you put it at the base of the lower box in the back, do you see smoke come out of those spaces 9 and 10 on the trim, which is Exhibit 24-A?

(Testimony of John H. Hollingsworth.)

The Witness: I was trying to qualify my answer, your Honor, in this respect: That I always see smoke coming out in the attic. I sometimes see smoke coming out of the side louvres, depending on the particular position that the smoke wand might be placed behind the box. If it is more nearly around the side of the box I will see smoke. I don't recall ever having seen smoke coming out the side louvres when the wand was placed directly in the center of the back of the wall. [164]

Q. (By Mr. Lyon): Now, Mr. Hollingsworth, defendants took some depositions in Wichita, which you attended, did you not?           A. Yes.

Q. And at that time they made in your presence smoke tests on heaters, Coleman heaters, that were similar to these in evidence, did they not?

A. Yes.

Q. And they took photographs of those tests at the time?

A. I don't recall that they were taken at the time. I think the photographs were taken prior to the tests. \* \* \* \* \*

Mr. Lyon: If your Honor please, in the last session we had, that is, when we began today, up until now the clerk calls my attention to the fact that I have been calling two exhibits by one number, and I would like to correct the record and show, where I referred to Exhibit 20-B I refer to both Exhibits 20-B and 20. I was referring to the entire lower heater, and 20-B is only the outer grid, and 20 is the heater itself. [165]

(Testimony of John H. Hollingsworth.)

The Court: Very well.

Q. (By Mr. Lyon): On these smoke tests that you have seen made, haven't you noticed that smoke comes out of the outlets 10 of Exhibit 24-A and enters the grilles 7 and 8 on Exhibit 24-A?

A. Yes, I have.

Q. Now, wouldn't that explain some of the smoke coming out of the economizer outlet?

A. That wouldn't explain the smoke coming out of the economizer outlet if the source of smoke were at the base of the heater behind the lower box.

Q. Why not? You see the smoke coming out of here and going into the economizer, how do you know that that isn't the smoke coming out of the economizer, rather than that that comes up the back?

A. I think I know that quite well, because the smoke tends to diffuse fairly rapidly, and I have never been able, myself, to detect any smoke that comes out of the side louvres of Exhibit 24-A and re-entering the top louvres of Exhibit 24-A. There might be a small amount that was doing that, which under just the proper conditions might be observed, but certainly I could not see any of that smoke coming out of the grille of the secondary heat exchanger by the time that it had traveled that extra distance.

Q. Can't the hot air or gases, or anything else coming [166] up the back and sides around the defendant's heater come right out those grilles, is there anything to stop them?

(Testimony of John H. Hollingsworth.)

A. I would doubt seriously whether any smoke coming up the back would come over and out there, although that I don't know absolutely. Smoke coming up the sides of the heater box will go out there, yes.

Q. Just referring back to that Metalbestos, Exhibit T, when they put that on a heater do they use draft hoods between the heater and the Metalbestos?

A. Yes, there is a draft hood on each appliance. Any gas venting appliance, normally where the vent is attached directly to the top of an appliance that does not have a second box or a secondary heat exchanger, it would attach to the top of the draft hood.

Q. Isn't it a fact that draft hoods very similar to the draft hood in the defendant's heater and in plaintiff's heater are required by law on all heaters and have been for many years before any alleged invention of yours?

A. Oh, yes.

Q. Mr. Hollingsworth, before any invention of yours there were space wall heaters similar to these that we have discussed, the defendant's and the plaintiff's, that had radiators substantially similar to the lower radiator?

A. Yes.

Q. They had burners in substantially the same way, did [167] they not?

A. Yes. The whole first box assembly is quite similar to those that have been in use for quite some time.

Q. Long before any alleged invention of yours?

A. Oh, yes. We built them ourselves long before that.



(Testimony of John H. Hollingsworth.)

Q. They had the draft hood, they had the outer box, the burner, the radiator, the baffle in the back of the radiator between the back of the box and the radiator?

A. Yes, in substantially the same configuration that is on these.

Q. And on top of those they often put ventilated flue stacks such as the Metalbestos, Exhibit T?

A. Oh, yes.

Q. Now, isn't it a fact that they ventilated those flue stacks from the room very often?

A. From the room?

Q. Yes, sir.           A. No.

Q. You don't know about that?

A. I would say no of my own knowledge, that that is something that was not very often done. It would be very rarely done, to the best of my recollection.

Q. Now, I will ask you, taking this Exhibit T—may I have it, please—if this device was hooked up, as you have said, to one of these exhibits, such as Exhibit 24, [168] would you not have air coming up the back of 24 flowing into the space where the Metalbestos was on top, and then that air flowing up through between the outer shell and the inner shell of the Metalbestos to cool that shell?

A. The combination where you would have a ventilated header plate, I imagine you could get that condition.

Q. You had ventilated header plates?

A. We never used them.

(Testimony of John H. Hollingsworth.)

Q. But there were?

A. Yes, they were used quite extensively.

Q. Will you explain to the court the difference between that construction that I have just described that you said has been used and the construction of the patent in suit, what element is different in the patent in suit than what you have just described?

A. The whole primary function of the elements of the patent in suit——

Q. I didn't ask about the function; I asked you about a specific piece of apparatus that is different than what you have described.

A. By that do you mean the physical shape?

Q. That's right.

A. Well, I think that the physical shape is substantially different.

Q. Will you tell us what it is, what difference there is, [169] please.

A. Yes. There is no opening provided in the annulus at the base of the flue pipe to receive air coming up around the box. There is no point of discharging——

Q. I beg to stop you one minute. What are the holes that I will mark in Exhibit T with an "X" with an arrow pointing to them? Those are not holes in the bottom to let that air into the annulus?

A. They are not holes that are connected with the passageway coming up behind the box. Those are holes provided to receive air coming down the stud space from the attic.

Q. But will not air enter from the bottom and

(Testimony of John H. Hollingsworth.)

enter that same space and flow up through there?

A. Only if I had a ventilated header plate there, and then it would be a very minor amount that might flow over into that area.

Q. Then, we would only have a minor amount that flows over in the defendant's box, would we not? He has a ventilated header and it is the only way it can get in there?

A. He has a full opening annulus on the four-foot heat exchanger, and he has a very substantial opening to that annulus on the side on the three-foot heat exchanger. These holes are holes on the order of a quarter or half-inch in diameter, and there are four or five of them shown along [170] the base of this jacket here.

The Court: Your last reference is to Exhibit T?

The Witness: In Exhibit T.

Mr. Lyon: I warn the witness now that I am going to produce a piece of Metalbestos, and I can tell him now that the openings are a lot larger than he is referring to, and they are bigger than the opening in the defendant's structure.

The Witness: I was judging the size of the opening from the drawing and from my recollection of some pieces of Metalbestos.

Q. (By Mr. Lyon): All right. Assume that they are on the order of the same size of the opening in Defendant's structure, what would be the difference in operation between the two?

A. Then I would have to know what the size of

(Testimony of John H. Hollingsworth.)

the openings were in the ventilated header plate, because that would control.

Q. Well, if they are the same as they are in Exhibit 24.

A. There are no ventilated openings in Exhibit 24.

Q. All right, then. In Exhibit 24-B. These holes that I point to right here are what you call the—at the very bottom of Exhibit 24-B—are what you call the ventilated header?

A. Yes. Those holes are approximately three-quarters [171] of an inch in diameter, and there are four of them.

Q. Four holes?

A. (Continuing): And that would be substantially less than the area that is provided in the secondary box on any of these exhibits.

Q. But that is how the air gets through into this—this air that you claim comes up the back gets into the economizers, isn't it? A. Oh, no.

Q. Will you explain how it gets through otherwise?

A. Through the holes that I refer to in the ventilated header plate, it does not come through there.

Q. Where does it go through those?

A. It goes into the attic through those through the stud space.

Q. All right. You are getting air, though, in Exhibit T from the back up through the annulus of your ventilator flue stack, aren't you, in Exhibit T?

(Testimony of John H. Hollingsworth.)

A. I would say no, because there is apparently no ventilated header plate here.

Q. You have stated that they were used with ventilated header plates.

A. Under conditions where a ventilated header plate was used, as I stated before there could be some air that would move through the holes provided in the ventilated header [172] plate that came from behind the box, and that some portion of that air could enter these holes at the base of the jacket of the vent, yes.

Q. Then the only difference in operation between Exhibit T and the patent in suit is the fact that Exhibit T has no outlet to the room from the annulus?

A. Oh, no, that is not the only difference, not by any means.

Q. Will you give us a physical difference?

A. Operationally it is substantially different in this respect, as I think I have pointed out in the patent, this device noticed in conjunction with the draft hood that controls the amount of dilution air——

Q. Isn't that merely not a mechanical difference, but a difference merely in degree of the size of operation, and so forth?

A. No. That is a functional matter that is very important.

Q. Yes, but isn't it a matter of merely degree of difference between the two, they both take air in the



(Testimony of John H. Hollingsworth.)

same place, they both run it through the same way, they both get it from the same source?

A. I would say——

Q. And you enlarged the openings is what you are trying to tell us, so that you got more flow, but that was just an increase of flow?

A. Oh, no. I think you are taking single portions of the element in this claim and relating them to this, and——

Q. I am not asking him——

The Court: To “this” is Exhibit T?

The Witness: Exhibit T.

Mr. Lyon: I am asking him about the physical description that he has made of this, and not what he is claiming.

The Court: You are really asking an argumentative question. As that question stands he is entitled to argue his answer.

Mr. Lyon: But I am not asking him about the claim at all; I am asking him about the description of the patent in suit.

Does that not describe the same thing here except the size of the openings?

The Witness: I don’t believe so. [174]

Q. Well, what physical part is different?

A. The size is different of the flue pipe in Exhibit T as compared with the secondary heat exchanger. The holes that are provided for ventilation are different. The fact that there is no discharge opening into the room from Exhibit T—there are a considerable number of physical differences.

(Testimony of John H. Hollingsworth.)

Q. Have you stated them all?

A. No. There are more that relate to the heater itself; the draft hood and the fact that the top of the annulus in the vent pipe is not sealed off, but rather is open out to the attic or outdoors.

Q. Well, that comes back to the fact that you didn't have an opening into the room then.

A. That's one of the points. As I attempted to describe here, there are several others.

Q. Well, have you not told us that draft hoods, similar to these radiators, similar to these——

A. Only in appearance, not in function.

Q. ——boxes; and boxes were on the market and sold regularly before you designed this device?

Mr. Christie: We have been very lenient in this matter, but it seems that it has gone way beyond the course of the direct examination. He is now asking questions which bear not on the question of infringement but on the question of validity, and we object to any further line of cross examination[175] in this direction, until the witness has testified on the question of validity and on the aspects of the patent which are now being discussed.

The Court: Overruled.

You are referring now to the physical aspects, is that your answer, physical appearance of these various——

The Witness: The physical appearance of these various units is quite similar, but the functional aspects are substantially different.

Q. (By Mr. Lyon): Now, are these necks that

(Testimony of John H. Hollingsworth.)

are shown in Exhibit 20 described in the patent in suit?      A. No.

Q. There is no constriction of the lower radiator in the patent in suit, is there?

A. It is implied.

Q. Would you please show us where it is implied?

A. Well, first of all, to anyone that is familiar with the art, it would be implied without having said it because it is a necessary part of the design of the appliance, to provide some constriction at the upper end of the first radiator in order to have the heater function properly in order to maintain some control over the gas-air mixture in the first radiator.

Q. But it is not stated in the patent, is it?

A. Not specifically, no, sir. [176]

Q. Not even referred to?

A. No, sir. I wouldn't consider it necessary to refer to that. Reference to the draft hood would imply that.

Q. You mean that is part of a draft hood?

A. In its function.

Q. Those necks are part of the draft hood?

A. In one of the functions of the draft—let me rephrase that. Referring to one of the functions of the draft hood, as they are designed on these appliances, yes, it would be a part of the draft hood. One of the functions of a draft hood, as they are normally designed on the appliance exhibited in Exhibit 24, is to provide some control through restric-

(Testimony of John H. Hollingsworth.)

tions over the rate of flow through the first radiator, or in order to maintain control over the amount of air that is drawn into the bottom of the radiator and mixed with the gas and burned; and those tubes partially perform that function, in conjunction with portions of the draft hood which are helping to perform that function.

Q. Would you accept the definition of the A.G.A. of what a draft hood is?

A. In part I would. I think, as I mentioned, that the draft hood as shown in Exhibit 24 has some other functions than the one that would be defined in the A.G.A. I am very familiar with that definition.

Q. Where can you point out to us in the literature, or [177] anything else, that a constriction is necessarily or advantageously used between the draft hood and the radiator?

A. Well, I can point to one on your own—or on Exhibit 24, which is this member right here (indicating). That member was put in there to provide some control over the gas-air mixture flowing up to the first radiator.

The Court: You are referring to what has been previously referred to as the neck?

The Witness: To a portion, and a baffle or restriction which has been added to the neck of the first radiator shown in Exhibit 24.

Q. (By Mr. Lyon): When was this heater, Exhibit 20, manufactured?      A. This specific one?

Q. Yes.

(Testimony of John H. Hollingsworth.)

A. I don't know exactly. I would have to look at the serial number and check our company records.

Q. Have all of the Holly heaters been manufactured with the necks as shown in Exhibit 20?

A. Those manufactured with secondary heater exchangers, yes.

Q. Since the first ones?

A. Yes. A neck of some sort has been used on every one of them, as I recall.

Q. And the draft hood wouldn't function without those necks?

A. Oh, no, I didn't say that.

Q. You say they are part of it.

A. I say, functionally, that they provide a source of constriction on the first radiator in the same manner that that portion of the draft hood performs that function; further, they are part of the draft hood in this sense, that they direct the flue gases into the draft hood in such a manner that the draft hood can be designed to function properly.

Q. Now, Mr. Hollingsworth, it is your opinion one of these heaters constructed identically with Exhibit 20 would meet the description of the patent in suit when it was installed in a wall formed with expanded metal and plaster?

A. The physical appliance would, yes.

Q. It would?

A. The installation would have no bearing on the physical appliance and the way—

Q. How could it operate in the manner of Exhibit 20 then?



(Testimony of John H. Hollingsworth.)

A. It wouldn't operate in the manner that the patent discloses.

Q. It couldn't operate in the manner of the patent in suit, could it?

A. Oh, yes, it could operate, but not as effectively. [179]

Q. Well, I call your attention to a document here which is entitled "Instructions for Installation and Operation of Holly Narrowall Recessed Heaters (S & D Series)," and it states herein, and I will read it to you——

The Court: Is that an exhibit here?

Mr. Lyon: No, it is not. I just want him to identify it.

Q. "Do not use metal lath which allows plaster to squeeze through and touch the Secondary Heat Exchanger. No insulation or sheet metal is needed to protect the walls from the Heater or Secondary Heat Exchanger. Use of insulation will block air passages around the heater and void A.G.A. approval."

Now, that machine could not, under this description, operate in the manner that you have described, Exhibit 20, could it, if you had those plaster keys?

A. Yes. It could operate in that manner.

Q. Where is it going to get the air that cools the secondary heat exchanger?

A. From up the box sides, between the box and wall; and in addition to that you must remember that the heater is provided with spaces on the back

(Testimony of John H. Hollingsworth.)

of it, both the Holly, Exhibit 20, and the Coleman, Exhibit 24, and the Coleman, Exhibit 25—in fact, any conventional wall heater is provided with spaces on the back of the box to provide spacing from the [180] wall to insure air movement up the back of the box behind the box to keep the wall cool. The walls are plastered before the box is put in so that any plaster keys that are projecting through would be there at the time it was installed, and the spacers behind the box would interfere and provide the space.

Q. I will hand you the document I have been referring to and ask you if that is not a photostatic copy of the instructions of the plaintiff?

A. Yes, sir.

Q. And does that not state that this device would be inoperative if so used?

A. No. It doesn't state that. It states it would void the A.G.A. approval.

The Court: Do you wish it marked?

Mr. Lyon: I will offer this exhibit in evidence as defendant's exhibit next in order.

The Court: Any objection?

Mr. Christie: No objection.

The Court: Exhibit U, is it?

Mr. Lyon: Yes, your Honor.

The Court: Exhibit U is received in evidence.

(The document referred to was received in evidence and marked as Defendant's Exhibit U.)

[See Book of Exhibits.]

(Testimony of John H. Hollingsworth.)

The Witness: If I might explain why we state this, we say "do not use metal lath which allows plaster to squeeze [181] through and touch the secondary heater exchanger." That is because of the thermo contact that you get between the secondary heat exchanger jacket, the second box and the wall, which would raise the temperatures on the wall.

Q. (By Mr. Lyon): That is not the part that I was reading.                   A. You read that.

Q. But I am talking about—it says not to use this heater with that type of construction.

A. It says here in this separate paragraph—or, perhaps it isn't a separate paragraph—"air passages around the——"

Excuse me. It says, "use of insulation will block air passages around the heater and void A.G.A. approval," and that is correct. The reason that has been put in there is because we have found by experience in the field that certain installers have the concept that insulating material is a better insulator than an air passage. They are, of course, much mistaken. Still it is a concept they have. We have found that they have completely enclosed the space between the heater box and the wall with insulating material, and that of course affects the operation of the appliance, and it voids the A.G.A. approval, because any alterations to the appliance voids the A.G.A. approval. We attempt to emphasize, or to eliminate any tendency on the part of the installer to [182] put insulation in in that man-

(Testimony of John H. Hollingsworth.)

ner by strongly stating it voids A.G.A. approval, which is important to him.

Mr. Lyon: I think that is all of this witness.

The Court: It affects his insurance? It affects the warranty? Why is A.G.A. approval important to him?

The Witness: Because in any municipality, for example the city of Los Angeles, an appliance cannot be installed unless it has been approved by a nationally recognized testing agency, which is the American Gas Association, and anything that would void that approval makes the heater illegally installed.

\* \* \* \* \*

### Redirect Examination

Q. (By Mr. Christie): Mr. Hollingsworth, you have testified that you computed the cross-section of the radiators, the lower radiators, Exhibits 24 and 25, which are, I understand, the same radiator, without computing, without using the volume of the neck as part of it. Have you also made any computations as to what the cross-section is, the mean cross-section when the necks are included?

A. Yes, I have made some approximate computations on [183] that; not accurate to the extent that these other computations were made, but the area of the first radiator would still be substantially larger than that of the second radiator in cross-section even if the tubes were included.

Q. Do you have any figures for that?

A. Not with me, no, I don't.

(Testimony of John H. Hollingsworth.)

Q. What would you say with respect to the Holly heater if in computing a mean cross-section you included the tubes, which in Exhibit 20 are marked "wax"?

A. It would alter the ratio of difference of cross-sectional area between the first and second radiator, but the first radiator would still be larger than the second radiator.

Q. In cross-section? A. Yes.

Q. Horizontal cross-section? A. Yes.

Q. And have you made any calculation of that?

A. Yes.

Q. And do you have those here?

A. No, I don't.

Mr. Christie: In order to proceed, I wonder if we might have leave of the court to have Mr. Hollingsworth produce those later, perhaps on Tuesday?

Mr. Lyon: Your Honor, I will offer a stipulation that [184] the mean cross-sectional area of the heaters of both are smaller than the mean cross-sectional area, or larger than the main cross-sectional area of the second radiator; if that is sufficient.

The Court: That is, both plaintiff and——

Mr. Lyon: Even if he includes the necks in that mean area.

The Court: Neck and tubes?

Mr. Lyon: Neck and tubes, yes.

Mr. Christie: Do I understand you to say, Mr. Lyon, that you are willing to stipulate that the mean



(Testimony of John H. Hollingsworth.)

cross-section of the lower radiator in both plaintiff's and defendant's devices is larger than the mean cross-section of the upper radiator of the secondary heat exchanger even when the tubes are included?

Mr. Lyon: That is right. But I do not want the court to understand that I am stipulating that the cross-section at any point is less or greater.

The Court: You are referring to the mean or average cross-section?

Mr. Lyon: That is right, strictly the mean.

The Court: Very well. Now, that stipulation applies both to the Coleman heater, the defendant's Coleman heater, and the plaintiff's Holly heater?

Mr. Lyon: That is right, your Honor.

The Court: Is that your understanding, Mr. Christie? [185]

Mr. Christie: That is my understanding.

The Court: Then the degree of difference, I take it, is not important, just the fact that the lower is larger than the upper?

Mr. Lyon: I don't believe there is anything in the patent that says any degree of difference, your Honor, so——

Mr. Christie: This is argument, your Honor, by counsel on the other side. We would prefer to go into this matter of the degree of difference, and its importance on the question of validity, which is really part of our rebuttal.

The Court: Very well.

Mr. Christie: Mr. Hollingsworth, I believe that

(Testimony of John H. Hollingsworth.)

Mr. Lyon referred to certain A.G.A. tests as to the method of determining thermal efficiency.

I would like to have a booklet which is called "American Standard Approval Requirements for Central Heating and Gas Appliance, Volume IV," marked for identification as plaintiff's exhibit next in order. I believe it is——

The Clerk: 32.

Mr. Christie: 32.

The Court: It will be so marked.

(The booklet referred to was marked as Plaintiff's Exhibit No. 32 for identification.)

The Court: Do you offer it in evidence?

Mr. Christie: I am going to ask Mr. Hollingsworth to [186] identify it first, your Honor, if I may.

Mr. Lyon: I have no objection to it going in evidence.

The Court: Is it stipulated to be genuine in all respects what it purports to be?

Mr. Lyon: That is right.

Mr. Christie: Then I will offer it in evidence.

The Court: Plaintiff's Exhibit No. 32 for identification is received in evidence.

(The booklet referred to was received in evidence and marked as Plaintiff's Exhibit No. 32.)

[See Book of Exhibits.]

Q. (By Mr. Christie): I call your attention particularly, Mr. Hollingsworth, to the section on page 23 entitled "2.9 thermo efficiency," and ask

(Testimony of John H. Hollingsworth.)

you if that is the test of thermo efficiency which you referred to in your cross examination?

A. That is one of the tests of thermo efficiency that I referred to, yes. [187]

Q. And what other test did you refer to, Mr. Hollingsworth?

A. These tests are the requirements effective January 1, 1954. Earlier requirements provided a test procedure which was slightly different for taking thermo efficiency.

Q. How did that test procedure differ, if you know?

A. The test procedure differed in this respect: that the procedure prior to 1954 was to attach a four-foot length of vent to the top of the appliance, irrespective of the appliance height, and flue temperatures were measured with a vent of that height. The requirements that you have handed me here, Exhibit 32, which are the later requirements, require that the vent height be such that the top of the vent is 12 feet above the test floor.

Q. Do you know of your own knowledge how these changes and requirements for thermo efficiency tests came about?

A. Yes, I do. I am a member of the Advisory Panel for Ventilated Recessed Heaters, which does most of the initial groundwork in writing these requirements. The change in vent height the test procedures, was a result of our discovery which is disclosed in the patent, that the efficiency was seriously affected by vent height on conventional ap-

(Testimony of John H. Hollingsworth.)

pliances at that time. And it was on that basis. And on the further basis of requirement research investigations that were run by the American Gas Association to [188] determine the effect of vent height on efficiency, that these requirements were changed.

Q. What is the effect of vent height upon efficiency?

A. Vent height changes the draft that is available within the vent——

Q. By “vent,” do you now mean flue or chimney?

A. I mean flue or chimney. The height of the flue or chimney affects the total draft or the chimney action that exists in the flue, by virtue of its height. That, in turn, will affect the amount of dilution air that is drawn into the relief opening of the draft hood. I believe, as I described earlier, one of the functions of the draft hood is to negate any effective draft in the flue—negate it in the flue in the combustion zone of the appliance, and that it does by drawing in air through the relief opening of the draft hood. Therefore additional vent height which produces—or additional flue height which produces additional draft also produces additional dilution at the draft hood relief opening. This being normally located in the area of the warm air discharge from the appliance, it draws heated air from the room in substantial enough quantities and discharges them out through the flue to affect the efficiency seriously.

In fact, it affects the efficiency on the order of

(Testimony of John H. Hollingsworth.)

one per cent for each added foot of vent height above the four-foot [189] height that was used in the earlier test procedures.

Q. You have just made reference to the function of the draft hood. In the patent in suit do you find any reference to the function of the draft hood? Is it described there? A. Yes.

Q. And if so, will you read what the patent says about it and identify the column and lines?

A. Column 3, line 54:

“The function of the draft hood or diverter in the device of the invention is to stabilize draft conditions existing within the lower radiator regardless of variations in draft conditions above it. This is accomplished by placing suitable baffles in the draft hood (so as to direct the flow of gas properly) and by the vent which provides a source of relief air.”

The vent referring to what I have been previously calling the relief opening.

“The draft hood does not control the draft action established within the flue by only its effect on the combustion zone in the lower radiator.

“Draft in a flue may be controlled satisfactorily and safely in many instances by a damper. They have been used for many years in the flues [190] of fireplaces. Adjustable dampers, however, are not satisfactory in the flue of a gas-burning device, because of the possibility of asphyxiation. Recognized testing agencies and governmental bodies condemn



(Testimony of John H. Hollingsworth.)

them, and they are forbidden in many places by building codes and ordinances."

Q. Do you make any reference in the patent in suit at any point to any further instruction as to how to proportion the horizontal cross-section of the upper radiator with respect to the horizontal cross-section of the lower radiator?

A. Yes, I do.

Q. Would you identify the place and read it, please?

A. It might take me a moment to find it.

Yes. It is line 75, column 3.

Q. What do you say there?

A. "Frictional resistance to laminar flow is essentially proportional to the velocity of such flow. But under conditions of turbulent flow resistance to flow is more nearly proportional to the square of the velocity. Consequently, if the horizontal cross-section of the upper radiator is constricted, preferably until turbulent flow conditions obtain, a large increase in draft, say due to a tall chimney or a high wind, will have a [191] minimum effect at the draft hood below the radiator. Hence the suction at the relief opening of the draft diverter tends toward a constant value. If the system is designed so that it barely draws in air through the draft hood with a short flue (say one four-feet high) it will pull only a slightly greater proportion if the flue height is increased. Loss of heat by leakage through the draft hood into the second radiator may thus be held at a low figure even if the wall

(Testimony of John H. Hollingsworth.)

heater is installed with a flue system that creates excessive draft, and heating efficiency is thereby improved.

“In other words, the cross-section of the second radiator is chosen so that as a conduit it will just handle the maximum products of combustion to be conducted in the first radiator, with scarcely any dilution through the draft hood. With such a design, a marked increase in draft will produce a minimum increase in draft at the base of the second radiator, and hence a minimum increase in dilution through the draft hood.”

Q. Now, did you illustrate that effect at any point in the patent?

A. Yes, Figure 6 of the patent illustrates that.

Q. Will you describe what Figure 6 is?

A. Figure 6 illustrates the effect of flue height on efficiency. The curve denoted “Heater A” on the graph refers to conventional wall heaters. By “conventional” I am speaking of those that do not have the device disclosed in the patent.

Heater B is the heater in suit, Exhibit 24.

Q. Did you mean that?

A. Exhibit 20. Excuse me.

To state it another way, Heater A might represent the wall heaters produced by Holly Manufacturing Company prior to use of the secondary heat exchanger. Heater B would illustrate the wall heater with the secondary heat exchanger designed—built in accordance with the patent. This illustrates that the efficiency loss due to flue height ma-

(Testimony of John H. Hollingsworth.)

terially affects heaters of conventional design, but has only a small effect on a device with a secondary heat exchanger.

Q. Referring to Defendant's Exhibit T, and particularly to the page which I believe is the front of the exhibit—excuse me, your Honor. May I ask Mr. Lyon which is which?

Let me have the original of Exhibit T.

The Witness: I have it here.

Mr. Lyon: Mark the page, please, that you are referring to, because it doesn't show which is the front or back. [193]

Mr. Christie: I will mark the surface to which I am now referring as "Front."

The Court: The front of Exhibit T?

Mr. Christie: Front of Exhibit T.

And particularly to the diagram appearing in the lower left-hand side, and I ask you to explain to me what the arrows show with respect to the flow of air in and around the Metalbestos flue.

The Witness: The arrows illustrate that air is drawn from the attic into the stud space in which the flue is confined, downward to the base of the flue, and then into holes provided in the side of the outer jacket of the flue, and then upward through the annulus provided by the inner flue pipe and the outer jacket, and upward out through the flue.

Q. (By Mr. Christie): Now, is this the flow that is contemplated in the secondary heat exchanger of the patent in suit?

A. No, it has no bearing on that flow.

(Testimony of John H. Hollingsworth.)

Q. What is that flow, as distinguished from this one that we have seen on Defendant's Exhibit T.

A. That flow differs from this in that it is, first of all, air drawn from the heated space in the room near the floor level and upward behind the heater and into an opening provided at the base of the secondary heat exchanger, which [194] is completely separated from that space communicating with the attic, and then upward in the annulus of the secondary heat exchanger and back into the room. The flow through the device shown in Exhibit T is completely separate from the room.

Q. What happens to the heat that is carried up in the annulus of the Metalbestos flue?

A. Well, it is normally discharged outdoors. It could, under some installation conditions, be discharged in the attic.

Q. What effect would this have on the heat in the room?

A. It would have no effect on the heat in the room. Whatever heat would be recovered from the vent pipe due to that flow would be lost.

Q. So does this represent an increase or decrease in the thermal efficiency of the heater? By "this" I mean the flow up into the attic or into the ceiling, or into the outside?

A. As compared to the secondary heat exchanger it represent a decrease.

Q. Now, referring to the other side of defendant's Exhibit T, which I will mark "Back," and to the diagram appearing at the lower center, I notice

(Testimony of John H. Hollingsworth.)

that this shows a grille, which is marked, "Or ventilating louvres alternative," would you describe the action of the device that is shown in [195] this diagram at the lower center of the back?

A. That is the louvre that was marked "A" by Mr. Lyon?

Q. That is correct.

A. Yes, that device would provide some cooling to the wall surfaces by allowing air to enter from the room through the ventilation louvres, and then upward into the attic.

Q. How do you compare the flow through that louvre with the flow through the louvre or upper grille of the secondary heat exchanger of the Holly device or the device of the—any of the accused devices?

A. It would be completely opposite to the flow discharged from the secondary heat exchanger in the Holly device. It would be somewhat similar to the flow that exists in the upper half of the three and four-foot economizers of the Coleman device. It would differ there, however, in that the flow would not be within the stud space, but within the jacket of the economizer.

Q. Do the Coleman economizers let air out of the secondary heat exchanger into the room through the upper grille?

A. Yes.

Q. And I understand your testimony to be that the upper grille in the Coleman economizer has two portions, a lower of [196] which let air out into the room, and the upper of which takes air out of



(Testimony of John H. Hollingsworth.)

the room back up into the stack or the attic, is that correct?           A. Yes.

Q. What would be the effect on the efficiency of the thermal efficiency of the device of the louvre which is shown in the lower center on the back of Defendant's Exhibit T?

A. It would reduce the total heat input to the room by virtue of the fact that it would be taking heated air out of the room and putting it into the attic.

Q. What would be the effect of the upper portion of the grilles on the economizers in the Coleman devices?

A. It would be substantially the same effect.

Q. Now, what would be the effect of the lower portion of the grilles on the Coleman economizers?

A. They would contribute heat to the room.

Q. And I believe you testified that in the Holly device, Plaintiff's Exhibit 20-A, there is a flow into the room from the grille of the secondary heat exchanger, but not back from the room into the attic?

A. That is correct. The only flow is into the room.

Q. Mr. Lyon asked you what would be the structure resulting if you put the Metalbestos flue shown in Defendant's Exhibit T on top of a conventional wall heater as it existed as of the time that you say you made the invention? I wonder [197] if you would be good enough to draw what the result of that combination would be, and explain to me how it would operate?

(Testimony of John H. Hollingsworth.)

A. This I will mark "Metalbestos Flue."

Mr. Lyon: Why don't we just put a letter or number instead of having to write a lot of legends on it?

The Witness: I don't think I will need to write many. I just wanted to identify the flue and the heater.

Mr. Christie: The lower box?

The Witness: The heater lower box, yes. The device would operate in this manner: that air drawn in here (indicating)——

Mr. Christie: Please identify it.

The Witness: At the floor of the——

Mr. Lyon: Can't we have a colored pencil to show that flow?

The Witness: I will use a pen.

Mr. Lyon: All right.

The Witness: The blue arrows, which describe the flow, consistent with the other blue arrows that we have used in other previous exhibits, would flow up behind the heater box in the wall out over the top of the box into the room in those instances where the header plate was not of a ventilated type. Where the header plate was of a ventilated type some air would flow up through the ventilation holes into the stud space. In addition, air would flow downward, which I will [198] draw with a pencil, into the holes provided at the base of the Metalbestos flue, and thence upward in the annulus and out the vent. Air flowing through——

(Testimony of John H. Hollingsworth.)

Q. (By Mr. Christie): By the vent, do you mean——

A. Out the flue.

Q. Where would that go, eventually?

A. In most instances it would go out the top of the flue to the atmosphere. [199]

Q. Would it ever go into the room?

A. Never into the room. It might conceivably go into the attic. In addition, air would be drawn through the louvres that have been described in Exhibit T, probably.

Q. Mark the louvres, would you please, Mr. Hollingsworth?

A. Air would be drawn from the room through the louvres upward into the attic space, I would assume, because there would be some heat from the wall there. Air also would be drawn downward into the annulus provided in the Metalbestos.

Q. And then where would it go?

A. Which would then go again up and out the flue.

Q. Now, would any of the air coming up through around the back of the lower box come out through the louvres into the room, the upper louvres?

A. There would be no reason, through fluid mechanics, that I could see, that would make it do that.

Q. Do you know that there ever was such an installation as you have now drawn here on this paper?

Mr. Christie: And I will ask to have this marked in evidence as Plaintiff's Exhibit No. 33.

(Testimony of John H. Hollingsworth.)

The Court: Is there objection?

Mr. Lyon: No objection, your Honor; except it has been asked and answered once.

The Court: Received in evidence. [200]

(The document referred to was received in evidence and marked as Plaintiff's Exhibit No. 33.)

The Witness: In strict combination with the Metalbestos flue shown in Exhibit T, I have not seen it. However, the ventilated louvre as shown in Exhibit T, in combination with other vents, I have seen; and in the field of actual installations. And, also, I have made similar installations in the laboratory during test work.

Q. (By Mr. Christie): How did those installations work? Would you describe where that installation was and when you made it and how it worked?

A. The installation that I made provided two louvres rather than one.

Q. Would you draw a sketch of that so that that may be understandable also?

A. I will draw it.

Mr. Lyon: Your Honor, this line of testimony now is objected to if this man testifies to what he experimented on. I can't see how that has any materiality. If he is testifying that these were things of public knowledge, I have no objection to the testimony. But if they were secret experiments, or things in his laboratory, they are not material in this case.

(Testimony of John H. Hollingsworth.)

The Court: What would be the purpose of it?

Mr. Christie: The purpose of this, your Honor, is to [201] show that this device which Mr. Lyon constructed by combining devices of the prior art is the device, and that moreover a similar and even better device which Mr. Hollingsworth himself developed and used prior to inventing the invention in suit was inferior, also.

Mr. Lyon: Nothing that wasn't public knowledge is material in one of these cases, your Honor.

Mr. Christie: I am sure that it is material for the same reason that your tests which you are about to offer were not a matter of public knowledge. They are still material. So are any tests that we have run, either before or after the inception of this suit. They bear upon the operation of this device or prior devices.

The Court: Overruled.

Mr. Lyon: But there was no such prior device of public knowledge. We were testing machines of public knowledge.

The Court: Overruled. He may answer.

Mr. Lyon: Then I understand, your Honor, that this is a purely secret experiment that he is testifying to now?

The Court: Anything that was known, either in the art or to him, that bears upon the issue of invention, I take it.

Mr. Lyon: It wouldn't be material because it is not prior art or prior knowledge, because to in any



(Testimony of John H. Hollingsworth.)

way affect the patent in suit, it has to be prior public knowledge.

The Court: It bears upon the novelty of it, I take it—— [202]

Mr. Christie: That is correct, your Honor.

The Court: ——the improvement, if any, which resulted in the patent in suit, rose to the dignity of invention.

The Witness: I have completed the drawing.

Q. (By Mr. Christie): Will you explain the drawing that you made and describe what it is and put on whatever legends you need?

A. The device that I am describing used two louvres and a sealed plate. Air was introduced—shown in ink—from the room into the lower louvre, which was just above the panel of the heater. That air then traveled up in the stud space around the vent and was discharged out of the upper louvre back into the room. The purpose of this device was to maintain circulation in the stud space for cooling purposes, and yet not lose any heat air from the room into the attic or out through the flue.

Q. As in the case of the Metalbestos flue?

A. Yes.

Q. And so to that extent it was an improvement over the Metalbestos flue?

A. In that respect it was an improvement over the construction used in Exhibit T, yes, in that it saved heated air, kept it in the room. And, further, it reduced wall temperatures to some degree.

(Testimony of John H. Hollingsworth.)

Q. And was this experiment that you described successful? [203]

A. I would say no, because we never recommended it in the field. We found that although it did provide some minor amount of cooling to the walls, it was rather ungainly looking and that the advantages that would accrue from such a louvre arrangement were not worth the cost and the deduction from the appearance.

Q. You mentioned that it had a slight effect in the wall temperatures. Where was the wall temperature affected?

A. In the area between the two louvres shown here on the sketch.

Q. Would you mark the area?

A. I will mark the area with an X, which by experience is the hottest area on the wall, adjacent to the vent, on the old conventional heaters which were used at the time we worked with this.

Q. Did you measure that temperature at that point that you marked X?

A. Not with thermocouples; only by feel.

Q. What was your impression?

A. My impression was that it was still too hot to avoid complaint from the field. Complaints from the field arose because customers felt hot walls above the appliance and became alarmed, and either called the fire department or the city health department, or the manufacturer, or whoever [204] they might feel could give them some help.

(Testimony of John H. Hollingsworth.)

Q. And did you feel that this was an adequate remedy to the hot wall problem?

A. Oh, no.

Mr. Christie: May I have this sketch to which the witness has just testified marked in evidence as Plaintiff's Exhibit 34?

Mr. Lyon: I will make the same objection; immaterial; merely speculative.

The Court: Overruled. It may be received in evidence.

(The document referred to was received in evidence and marked as Plaintiff's Exhibit No. 34.)

Mr. Lyon: And further that unless it is restricted to illustrating the witness' testimony——

The Court: I assumed it was offered for the purpose of illustrating the testimony.

Mr. Christie: That is correct. [205]

\* \* \* \* \*

Q. Mr. Hollingsworth, you have testified with respect to what controls the flow of the gas through the lower radiator, and it wasn't plain to me what does control that, and I believe that Mr. Lyon asked you repeatedly whether or not the cross-section of the radiator and the secondary heat exchanger, which we can refer to in the case of the plaintiff as Plaintiff's Exhibit 20-A, and in the case of the defendant as Exhibits 24-B and 25-A; and I think he asked you whether or not the cross-section of the upper radiator had an effect on the flow through the lower radiator.

(Testimony of John H. Hollingsworth.)

A. Yes, I believe he did ask me that question. And I believe I answered that it does not have any direct effect on the flow through the first radiator.

Q. Now, what does the cross-section of the upper radiator affect?

A. As I remembered in the patent, it affects the amount of dilution air or heated room air that is drawn into the relief opening of the draft hood under conditions of high draft in the flue.

Q. Now, what happens when you increase the size, the cross-section of the upper radiator on the flow through the draft hood, all other conditions remaining the same? [208]

A. The flow through the draft hood relief opening would increase.

Q. And what does this do to the thermo efficiency?

A. It reduces it because heated room air is drawn into the flue.

Q. Now, is it necessary to draw heated room air into the flue?

A. No, it is not necessary at all. It is necessary that the draft hood be so designed that it does not spill flue products back into the room. So to that extent, as a practical matter, it is almost necessary to draw a small amount of room air into the relief opening of the draft hood, just as a safety factor, to avoid any reversal of flow under normal operation, and having flue products spilling out into the room.

\* \* \* \* \*

(Testimony of John H. Hollingsworth.)

Recross Examination

Q. (By Mr. Lyon): Now, Mr. Hollingsworth, you have described and read a statement in the patent about how the size of the second radiator or flue in relation to the lower radiator will affect the draft through the second flue. Now, wasn't it actually well known and old in this entire business that the [209] flue coming out of the top of these draft hoods, if it was smaller than the radiator, would restrict the flow and not drawn a lot of cold air into the flue?

A. No, it wasn't well recognized.

Q. It wasn't?

A. No. I think I can answer that in this way: that all of us in the industry worked for a long time trying to solve the hot wall problem——

Q. I am not talking about the hot wall problem. I am talking about this flue flow that you mentioned. I would like to——

Mr. Christie: Have you finished your answer, Mr. Hollingsworth?

The Witness: No. The hot wall problem and the efficiency problem, I am speaking of those together. The efficiency problem was one that was serious to the extent that the requirements were changed. The 4-foot vent height which was used under the old test procedure and used for a good many years did not demonstrate the actual efficiency loss that would take place in the field because it was a substantially smaller vent height or flue height than that which actually existed under installed conditions, and yet



(Testimony of John H. Hollingsworth.)

it was used for a long time because no one recognized, to my knowledge, that the efficiency was affected so materially by flue height.

The laboratories had to run a requirements research investigation [210] to verify that fact themselves, and they are a nationally recognized agency. They ran those tests after we developed the secondary heat exchanger, and based on those tests the requirements were changed. So I wouldn't say that it was well recognized.

Q. (By Mr. Lyon): You mean that you discovered the fact that flue height was the thing that determined the flow or the draft in a pipe?

A. No, I didn't say that.

Q. I believe that is what your last answer stated.

A. Well, what I was trying to say was—if you misunderstood me—was that speaking in terms of these appliances of the art as we know it related to gas appliances, and wall heaters more specifically, that there certainly wasn't any degree of recognition of the fact that the efficiency of the appliance was seriously lowered by the added vent height that was placed on the appliance in the field over and above that that was used in the laboratories for test purposes. And further that it is the flow of relief air going into the draft hood increasing due to that increased vent height that produces that effect.

Q. Isn't it a fact that almost all of the heaters manufactured prior to your invention had smaller flue pipes on them than they had radiators?

A. The flue pipe used on a conventional heater

(Testimony of John H. Hollingsworth.)

is established [211] by the—by code requirements, and by the underwriter laboratories. For a very small appliance it might be substantially larger than the first radiator. It would depend entirely on the size of the appliance that was connected to the flue.

Q. What size flue pipe was recognized for use with a heater such as Exhibit 24?

A. What is determined as a type B 4-inch oval vent; the 4-inch meaning that it is equivalent in its operation to a 4-inch diameter vent.

Q. Now, isn't that a smaller area than is on the radiator in this device? A. Yes, it is.

Q. Then that at least was old.

Now, I refer you to column 4 of your patent in suit, the very part that you have discussed, starting at line 21. You state, "If the cross-section of the second radiator is chosen so that it accomplishes something——"

How do you choose that?

A. By tests. [212]

Q. By test, experimentation? A. Yes.

Mr. Lyon: I think that is all, your Honor. I am through with this witness.

Mr. Christie: One more question.

### Further Redirect Examination

Q. (By Mr. Christie): Mr. Hollingsworth, you started to answer a question by Mr. Lyon, in which you said something about a hot wall, in an attempt to solve a hot wall problem, and he interrupted you

(Testimony of John H. Hollingsworth.)

and you never finished your answer. Do you want to do that now?

A. Well, the hot wall problem has been one that has been serious to the whole industry, and it is one that has been very difficult to solve, it still is a problem to many people, and it is the hot wall problem, in conjunction with the efficiency loss problem, that we have attempted to correct, to overcome with this device.

The hot wall problem and the efficiency problem are difficult to solve, because the hot wall problem in the past has been corrected only by designing the draft hood so that—I should not say “only,” but one method of correcting the hot wall problem has been to reduce flue temperatures by drawing in more relief air into the draft hood and diluting [213] the flue products, and thereby lowering the temperature.

This was something that we did ourselves, in my own knowledge, and that a lot of our competition did, in an attempt to solve the hot wall problem. But it was this approach that so seriously affected the efficiency.

The Court: Is the hot wall problem one that, in essence, the capacity of the heater is limited by the fact that so much heat goes into the wall? As a practical matter you cannot install a high capacity heater by reason of the danger of fire in the wall?

The Witness: Yes. These heaters are designed to go into a four-inch thick wall, between normal studs which are on 16-inch centers. That means that

(Testimony of John H. Hollingsworth.)

the vent then is confined in a very restricted space, and obviously there is a limitation to the flue temperature that you can produce with an appliance of this sort. There is only so low a temperature that you can arrive at by heat transfer without getting into the law of diminishing returns, and therefore any further attempts to reduce temperature over and above that which you can accomplish by normal efficiency of heat transfer must be done by dilution of the flue products with some cooler air.

That was done quite extensively earlier in the art, and is still being done to some degree. But is that that aggravates the efficiency problem, because obviously if you are going to introduce a lot of room air into the draft hood [214] to lower flue temperature under conditions of test with a four-foot high vent, with a two-story vent, the amount of relief air that is drawn into the draft hood is very substantial, and thereby the efficiency is lowered that much more, so we have two opposing problems that we were confronted with. If we raise the flue temperatures by reducing the dilution air down to the bare minimum, we could attempt to partially solve the efficiency problem, but we certainly aggravated the hot wall problem.

Conversely, anything that we did to reduce the hot wall problem by increasing the dilution hurt us on the efficiency, again. So we had these two diverging problems that we were confronted with, and that is what this device does.

(Testimony of John H. Hollingsworth.)

The Court: The purpose of it is to take the heat off the hot wall and put it out into the room, is that it?

The Witness: Takes the heat off the hot wall and puts it in the room, thereby allowing us to operate with a higher flue temperature.

We can control the dilution air entering the draft hood, essentially, irrespective of flue height, because we have sized the cross-sectional area of the second radiator so that it will just barely handle the products of combustion coming out of the first radiator, plus some minor amount of dilution air. So that additional flue height is so constructed by the first radiator that the draft produced [215] by that additional flue height has little effect on the amount of dilution air that is drawn into the draft hood.

The Court: Do your specifications or drawings purport to give any dimensions for any particular apparatus?

The Witness: With respect to cross-sectional areas?

The Court: With respect to anything.

The Witness: Specific dimensions are not mentioned anywhere in the patent.

The Court: And these drawings are not to scale of any kind, is that it?

The Witness: No, sir, they were not intended to be.

The Court: They are purely illustrative?

The Witness: Illustrative drawings, yes. [216]

\* \* \* \* \*



## HENRY LANDSBERG

called as a witness on behalf of the plaintiff, having been first duly sworn, was examined and testified as follows:

The Clerk: Will you state your name, please?

The Witness: Henry Landsberg.

## Direct Examination

Q. (By Mr. Christie): Mr. Landsberg, would you state your full name, age, residence, and occupation?

A. Henry Landsberg, age 42; I live at 955 Medford Road, Pasadena, California; I am a chemical engineer.

Q. By whom are you presently employed?

A. Consolidated Engineering Corporation, Pasadena.

Q. What is your position with that company?

A. I am manager of the process instrumentation.

Q. How long have you been in that position?

A. In that particular position I have been about a year and eight months.

Q. Were you employed by the company previously to that, and if so, in what capacity?

A. By the company, you say, sir? [220]

Q. By Consolidated Engineering Corporation.

A. Prior to then I was manager of Titrilog section.

Q. What is the relationship of the Titrilog section to the process instrumentation group of which you are presently manager?

(Testimony of Henry Landsberg.)

A. We have more or less merged the two groups.

Q. Are you now in direct charge of both groups?

A. Right, sir. [221]

Q. You mentioned the Titrilog. How long has your experience been with the Titrilog?

A. For over five years now.

Q. What formal education have you had in engineering and chemistry?

A. I am a graduate in chemical engineering from Rice Institute in Houston, Texas.

Q. When did you get that degree?

A. 1935.

Q. What was your experience from the time that you graduated until you came with Consolidated Engineering Corporation?

A. I was an engineer for the Magnolia Petroleum Company, Dallas, Texas, for about six years. Then I spent four years in the service in command of a mobile petroleum testing laboratory. Also some chemical warfare experience for a short period in the Army. Then for about two years after the Army I was in the injection molding plastic business. And shortly after that I went to work for Consolidated.

Q. What year was that? A. 1949.

Q. Would you explain, Mr. Landsberg, what the Titrilog is?

A. The Titrilog is a device which actually takes a chemical, method of chemical analysis and mechanizes the procedure [222] in that it is used to analyze for oxidizable sulphur compounds, such as hy-

(Testimony of Henry Landsberg.)

drogen sulphide, sulphur dioxide, mercaptan, and so on.

The instrument operates on a principle of oxidation reduction in that the agent bromine is generated as the sulphur is absorbed in an electrolyte solution. The way the instrument actually operates is we start out with a sulphur-free air sample or some gas that is sulphur-free, being introduced into the cell continuously. At that time a small amount of bromine is generated. That bromine, not reacting with any sulphur, since there is none present, sets up a voltage across two sensor electrodes. That voltage is opposed by a reference voltage from a battery, so that the two voltages are equal and opposite. When a gas then enters the cell that contains this the cell is connected in series with a feedback system to a amplifier so that when a gas then enters a cell containing a sulphur compound, the sulphur compound will react with the bromine. Consequently, momentarily the bromine that was there has reacted and it is therefore not setting up a voltage to oppose the reference voltage and the balance is momentarily broken. That breaking of this balance sends a signal to the amplifier to increase the bromine generation so that a balance will again exist.

However a sufficient amount of bromine must be generated to satisfy the reaction, as well as the initial setting. [223] The difference between the initial setting or initial bromine level and the one during the titration of the sulphur is directly pro-

(Testimony of Henry Landsberg.)

portional to the sulphur concentration in the sample gas. The instrument does not record the bromine concentration, but it records the generating current which is directly proportional, or vice versa, rather, the bromine concentration is directly proportional to the generating current.

Q. Have you written any publications describing the Titrilog, Mr. Landsberg?

A. Yes, sir.

Mr. Christie: I will ask the clerk to mark for identification as Plaintiff's Exhibit No. 4 a document entitled "Potentiometric Instrument for Sulphur Determination."

(The document referred to was marked Plaintiff's Exhibit No. 4 for identification.)

Mr. Christie: I hand an extra copy to the court.

The Court: Electrolyte sulphuric acid?

The Witness: Yes.

Q. (By Mr. Christie): I hand you a paper which has just been identified as Plaintiff's Exhibit 4, and ask you if this is the article to which you had reference? A. Yes, sir. [224]

Q. When did this article appear, Mr. Landsberg?

A. This article appeared in the Industrial Engineering Chemistry, in the July 1954 issue.

Q. I notice that you are co-author with Mr. Edward E. Escher; explain who Mr. Escher is.

A. Mr. Escher is a chemical engineer who works in my section.

Q. Does this article accurately describe the con-

(Testimony of Henry Landsberg.)

struction and operation of the Titrilog to which you have referred in your testimony?

A. Yes, sir, it does.

Mr. Christie: I would ask that the document to which the witness has just testified be marked in evidence as Plaintiff's Exhibit 4.

The Court: Any objection?

Mr. Lyon: No objection.

The Court: Received in evidence.

(The document referred to was marked Plaintiff's Exhibit 4 and was received in evidence.)

[See Book of Exhibits.]

Q. (By Mr. Christie): Mr. Landsberg, did you employ the Titrilog in any tests that you made on heaters manufactured by The Coleman Company, the defendant in this suit?

A. Yes, sir, we used a portable model Titrilog.

Q. When were these tests conducted?

A. In July of this year, I believe it was, the 26th, [225] 27th.

Q. I show you a set of photographs previously in evidence in this case as Plaintiff's Exhibit 29, 29-A, -B, -C, -D, and -E, and ask you if you recognize these.

A. Yes, sir, those are pictures of the tests set up.

Q. Will you describe, Mr. Landsberg, in your words the tests that you conducted on the Coleman heaters?

The Court: Will you show him what you mean by the Coleman heaters, now?

Q. (By Mr. Christie): Mr. Landsberg, I am



(Testimony of Henry Landsberg.)

pointing to a portion of a heater previously in evidence as Plaintiff's Exhibit 24, which has been identified as the lower box of the heater which was employed with the four-foot heat exchangers or economizers of The Coleman Company; do you recognize this exhibit?       A. Yes, sir.

Q. Is that one which was employed in your tests?       A. Right, sir.

Q. And I call your attention to the next exhibit, which is 24-A, and which has been previously identified as a grille or, I believe, housing, which goes on the front of that heater; do you recognize that?

A. Yes, sir.

Q. And was that part of the equipment?

A. Yes. [226]

Q. Now, I call your attention to an exhibit previously marked Plaintiff's Exhibit 24-B, which has been identified as the Coleman four-foot economizer; do you recognize this exhibit?       A. Yes, sir.

Q. Is this one that was employed in the tests?

A. Yes.

Q. Now, I call your attention to another exhibit marked Plaintiff's 24-D, bearing the letters 5-A, 5-B, and 5-C, and ask you if you recognize that.

A. Yes, sir.

Q. Will you tell me what it is?

A. That is the upper grille, the lower portion of the upper grille where we made our tests.

Q. I call your attention to another exhibit marked 24-C, which appears to be a burner, and ask you to identify this.

(Testimony of Henry Landsberg.)

A. That is the burner of the furnace that was used.

Q. Now, I call your attention to another lower box marked Plaintiff's Exhibit 25, and ask you if you can identify that.

A. That is another burner or another lower portion of the furnace that we tested.

Q. And your attention is also directed to an exhibit marked 25-A; would you please identify that?

A. That is the upper—the heat economizer for the three-foot furnace.

Q. A further exhibit marked heretofore in evidence as Plaintiff's Exhibit 25-C, bearing in red pencil the notations 5-A, 5-B, and 5-C, I ask you to identify that.

A. That is the upper grille for the three-foot furnace.

Q. And another burner previously marked as Plaintiff's Exhibit 25-B?

A. That is the burner for that furnace.

Q. With the three-foot economizer?

A. Yes.

Q. Now, Mr. Landsberg, are these elements that you have just identified in the Coleman furnaces shown in the photographs marked 29 through 29-E, Plaintiff's exhibits?      A. Yes, sir.

Q. I call your attention to a large drawing previously in evidence as Plaintiff's Exhibit 21 in this action, and ask you to identify, if you will, the construction which was employed or the installation

(Testimony of Henry Landsberg.)

which was employed in the test of the Coleman four-foot economizer.

A. Do you mean the whole test set up?

Mr. Lyon: If your Honor please, I object to that line of testimony. This drawing was an exhibit to illustrate the testimony of another witness, and how this man can state that that is, unless he adopts that drawing as a construction that [228] he would call—they are trying to put this document in evidence as being a drawing of the Coleman heater.

The Court: A diagram of the operation of it, the mode of operation of it?

Mr. Lyon: Well, he merely asks him if this is a diagram that he used.

Mr. Christie: Your Honor, there isn't any secret about this. I am asking the witness to identify the drawing, because I expect to ask him to put on the drawing certain test points which he employed in the tests. They are also shown in the photographs which are already in evidence.

Mr. Lyon: I think the test points show better in the photographs than they do here in the drawing that somebody else made.

The Court: Lay the foundation. If the witness identifies this as a fair diagram of the heater he tested, he may place his markings on the diagram, as well as the photograph.

Q. (By Mr. Christie): Mr. Landsberg, I call your attention to the diagram on the right-hand side of the sheet marked Coleman four-foot econ-

(Testimony of Henry Landsberg.)

omizer, and ask you if this shows the installation of the equipment that you tested.

A. Yes, it does, with the exception of the tunnel that we had in front for the test purpose.

Q. Now, I ask you, with respect to the center drawing marked "Coleman with three-foot economizer," the same question, does [229] this show——

A. The same answer applies, that it is the test set up with the exception of the tunnel. [230]

Mr. Lyon: Your Honor, my objection was not to identifying the thing, but in marking up the exhibit which another witness has already drawn to illustrate his testimony, and if this gentleman confuses that, the record will be in bad shape.

The Court: As I understand, he is only marking the point where he connected the test equipment.

Mr. Christie: That is correct.

The Court: Is there any objection to that?

Mr. Lyon: That is my point, your Honor. It is not what this other gentleman testified then but what this man did. This exhibit is only in evidence as illustrating his testimony.

The Court: Do you have other copies?

Mr. Christie: Yes.

Mr. Lyon: That is what I prefer, your Honor.

The Court: I suggest you make use of them. And if the witness wishes to adopt it as illustrative of his testimony, he may do so.

Mr. Christie: I will ask the clerk to mark this

(Testimony of Henry Landsberg.)

sheet of drawings as Plaintiff's Exhibit 5 for identification.

(The document referred to was marked as Plaintiff's Exhibit No. 5 for identification.)

Q. (By Mr. Christie): Mr. Landsberg, with reference to Plaintiff's Exhibit 5 for identification, I ask you to tell me, if you know, what the diagram is appearing on the right [231] of the drawing.

A. That is the Coleman furnace with a four-foot heat exchanger.

Q. Does that show the test set-up that you employed?

A. Yes, with the exception of the tunnel.

Q. Now, I ask you, would you mark the portion of the drawing which you have just had reference to with a mark A, for convenience; just mark A at the top of the drawing, if you will?

A. (Witness complies.)

The Court: I think it might be well to identify the drawing with an exhibit number.

Mr. Christie: I think it is Plaintiff's Exhibit 5.

The Clerk: Yes. It has just been marked Plaintiff's Exhibit 5 for identification.

The Court: Very well.

Q. (By Mr. Christie): Would you mark a large A at the top of that?

Now, I ask you the same question with respect to the center diagram on Plaintiff's Exhibit 5 for identification. What would your answer be to that?

A. That is the 3-foot—the furnace with the 3-foot heater exchanger.



(Testimony of Henry Landsberg.)

Q. Does that show it as installed for your test purpose? [232]

A. It is with the exception of the test tunnel.

Q. Now, will you mark that central diagram with a large initial B?

A. (Witness complies.)

Q. Mr. Landsberg, with reference now to the photographs Plaintiff's Exhibits 29 to 29-E, will you describe the test set-up employed, first with the 4-foot economizer and later with the 3-foot economizer, employing the drawing, Plaintiff's Exhibit 5 for identification, for any purpose that you need in illustrating the tests?

A. A tunnel was placed in front of the furnace so that the inlet was completely surrounded by this tunnel. Within the tunnel we had a bottle of pure sulphur dioxide with a very small capillary so that a very small amount of sulphur dioxide was leaving the bottle continuously. Also in the tunnel there was a mixing blade which was somewhat of an adjusting—a rotating blade with no pitch so there would be no forward thrust of the air, just a blending of SO<sub>2</sub> or sulphur dioxide, with the air. And then we tested four points across the back of the furnace, approximately—

Q. Mark them, if you will, Mr. Landsberg. You are referring now to drawing A on Plaintiff's Exhibit 5 for identification?

A. Drawing A, there were four points across the back about approximately this point (indicat-

(Testimony of Henry Landsberg.)

ing), and those points [233] were marked 1, 2, 3, and 4.

The Court: You have now marked them on the exhibit?

The Witness: Yes, sir.

Q. (By Mr. Christie): Are those points shown on any of the photographs, Mr. Landsberg?

A. Those same points are shown on this photograph—which I am not sure whether it is the 3- or 4-foot. I think that's the 3-foot.

Q. Were they the same in——

The Court: "This photograph" being——

Mr. Christie: Exhibit 29-D, sir.

The Court: Always identify the exhibit number.

The Witness: All right, sir. Then those were to be test points. Then we established test points 7 and 8, which are the louvres at the upper portion of the panel,——

The Court: Exhibit——

The Witness: Exhibit 24-A, I believe that is.

Mr. Christie: 24-A.

Q. (By Mr. Christie): Do those show in any of the photographs, Mr. Landsberg?

A. And those show in photograph 29-C; points 7 and 8.

Q. Will you mark those test points?

A. And I will mark that test point here (indicating).

Q. On Plaintiff's Exhibit 5 for identification, the diagram that you previously marked A? [234]

A. Right, sir. Then we established points 5-A,

(Testimony of Henry Landsberg.)

-B, and -C, which is the upper grille of the economizer.

The Court: Exhibit——

The Witness: Exhibit 5.

Q. (By Mr. Christie): Mr. Landsberg, I call your attention to Plaintiff's Exhibit 24-D and ask you if this shows the test points.

A. That shows the test points. And it is shown in the picture 29-C, 5-A, 5-B and 5-C.

Mr. Christie: Now, will you mark those locations?

(Witness complies.)

The Court: You have now marked those test points 5-A, 5-B and 5-C on drawing A on Exhibit 5 for identification?

The Witness: Yes.

Q. (By Mr. Christie): Now, will you go on, Mr. Landsberg, in your description of your test procedure? You mentioned certain sample points. Will you describe how the samples were taken at the several points, 1, 2, 3, 4, 7, 8, 5-A, 5-B and 5-C, and explain what you did with the samples, if anything?

A. We had quarter-inch tubes into the air space at points 1, 2, 3 and 4; and a sample was taken at these points and introduced to the Titrilog. That is, at each one of these points a sample was taken for a short period of time while the instrument recorded the concentration. [235]

We also took samples at points 7 and 8 by laying our quarter-inch sampling point as close as

(Testimony of Henry Landsberg.)

possible to the louvres to indicate the concentration, sulphur dioxide concentration of air entering at these points.

Then at points, sample points 5-A, 5-B, and 5-C, we used a funnel—I think it is approximately two inches in diameter at the outer edge—connected to the quarter-inch tubing, and tested across that grille, using a funnel, with the idea that we'd get a more representative sample.

The Court: "That grille" is the upper grille?

The Witness: The upper grille, yes, sir.

Q. (By Mr. Christie): Would you describe points 7 and 8?

A. Yes. 7 and 8 are the louvres at the upper portion of Exhibit 24-A.

Q. You have made reference to certain tubes in connection with your sampling points 1, 2, 3 and 4. How were those tubes connected?

A. To the furnace, sir?

Q. If you will.

A. They were sticking through tight-fitting holes into the air space between the wall and the furnace.

Q. Can you show on Plaintiff's Exhibit 5 for identification one of those tubes in section? And will you mark that, if you will, with the legend "tube"? [236]

A. (Witness complies.)

Q. With reference again to your test points 1, 2, 3 and 4, will you describe just where each one of them was placed, having reference, if you will, to one of the photographs 29-A to 29-E?

(Testimony of Henry Landsberg.)

A. Points 2 and 3 were directly on the back; and points 1 and 4 were on the sides.

Q. Now, did points 1 and 4—how did the tubes enter the space, if they did, in the case of tubes 1 and 4? A. I don't quite understand. [237]

Q. I will try to rephrase the question. Will you explain how tubes 1 and 4 were connected to the space which you said was inside the wall and outside the heater?

A. They were through holes so that the tube—there was a tight fit there.

Q. Now, will you describe, Mr. Landsberg, what your test procedure was with respect to each one of the points? Did you employ the Titrilog to sample the gas at each one of those points?

A. The Titrilog was continuously running on fresh air, that is air that had no sulphur, by scrubbing it through a charcoal filter, and that establishes our zero level. Each time we would establish a zero level we would then connect to one of the tubes or one of the test points, and allow that to establish a record for a short period of time. Between each test point we re-established a zero level, and we tested points 1, 2, 3, and 4, and 7 and 8, and 5-A, -B, and -C.

Q. As you have previously described?

A. Yes.

Q. Where did you run the gas that you withdrew from each one of these test points?

A. That gas was introduced into the Titrilog.  
Mr. Christie: I would like to offer the drawing



(Testimony of Henry Landsberg.)

about which Mr. Landsberg has testified as Plaintiff's Exhibit 5, [238] is illustrative of Mr. Landsberg's testimony.

The Court: Is there objection?

Mr. Lyon: No objection.

The Court: Received in evidence.

(The drawing heretofore marked Plaintiff's Exhibit 5 was received in evidence.)

Q. (By Mr. Christie): Mr. Landsberg, you have described certain test points and given them identifying numbers. Do these apply both to the three-foot economizer and the four-foot economizer?

A. They do.

Q. I will ask you, then, to mark those points on Plaintiff's Exhibit 5, drawing B, that you testified illustrates the three-foot economizer installation.

(Witness does as requested.)

Q. (By Mr. Christie): You are now marking on drawing B of Plaintiff's Exhibit 5, and you have identified that with the word "tube"; is that correct?

A. Right, sir.

Mr. Christie: I will ask the clerk to mark for identification as Plaintiff's Exhibit 6 a group of test records or chart records.

Mr. Lyon: You may offer them in evidence. I haven't any objection.

Mr. Christie: Very well. I will offer them in evidence. [239]

The Court: They have been identified as charts of the tests that the witness has just testified to?

Mr. Christie: I will ask him that question.

(Testimony of Henry Landsberg.)

Mr. Lyon: I will agree that they are, your Honor.

The Court: Do you accept the stipulation?

Mr. Christie: I accept the stipulation.

The Court: Very well. Received in evidence as Exhibit 6.

(The documents referred to were marked Plaintiff's Exhibit 6 and were received in evidence.)

Q. (By Mr. Christie): Mr. Landsberg, I hand you Plaintiff's Exhibit 6—it was previously identified as Plaintiff's Exhibit 5 in the depositions—and ask you to tell me what these records show.

A. These are recordings of the Titrillog during the testing of these various points.

Q. Are the points at which your readings were taken identified on these?

A. Yes, sir, they are.

Q. And how are they identified?

A. By the number of the sample point.

Q. That you have previously testified to?

A. Yes.

Q. And do you distinguish the tests on the four-foot economizer and those on the three-foot economizer? [240]

A. I don't believe the records are so marked, because we took our data off and marked our data sheets. \* \* \* \* \* [241]

Mr. Christie: I believe he has tabulated those findings and tabulated them at the time. If I may, your Honor, I would like to proceed by having this

(Testimony of Henry Landsberg.)

document identified as Plaintiff's Exhibit 7 for identification.

The Court: It may be so marked.

(The document referred to was marked Plaintiff's Exhibit 7 for identification.)

Q. (By Mr. Christie): Mr. Landsberg, I hand you a sheaf of papers which has been marked Plaintiff's Exhibit 7 for identification, and ask you if you recognize these papers, and tell me what they are.

A. These are the notations of the readings off the records at the time of the deposition at the various points on both the four-foot heat exchanger and the three-foot heat exchanger furnaces.

\* \* \* \* \* [242]

The Court: Are the figures the same in Exhibit 7 as they are in the deposition?

The Witness: These are the figures that I wrote down in the presence of Mr. Lyon during the tests.

The Court: By "these" you are referring to Exhibit 7 for identification?

The Witness: Exhibit 7, sir.

The Court: And the figures stated in the deposition, are they the same?

The Witness: Yes, sir.

The Court: Subject to comparison would that be sufficient?

Mr. Lyon: Yes, your Honor. [243]

The Court: Do you offer Exhibit 7?

Mr. Christie: I offer Exhibit 7, subject to any comparison that Mr. Lyon may wish to make.

(Testimony of Henry Landsberg.)

The Court: Received in evidence.

(The documents heretofore marked Plaintiff's Exhibit 7 were received in evidence.)

Mr. Christie: I would like to have marked for identification as Plaintiff's Exhibit 8 a group of papers marked Computations for Holly Manufacturing Furnace Tests, and signed on the last page—bearing the handwritten signature of Henry Landsberg.

The Court: It may be so marked.

(The documents referred to were marked Plaintiff's Exhibit 8 for identification.)

Q. (By Mr. Christie): And I ask you to identify this document. \* \* \* \* \* [244]

Q. (By Mr. Christie): My question to the witness is: Mr. Landberg, will you identify this document?

A. This is a procedure showing how a formula was derived whereby we could determine the relative concentrations of the gas coming up the back of the furnace by using the concentrations as determined with the Titrilog.

Mr. Christie: Your Honor, I have another copy.

The Court: Hand it to the clerk. That is Exhibit—

Mr. Christie: Plaintiff's Exhibit 8.

The Court: Are you offering that in evidence?

Mr. Christie: I am offering that in evidence as illustrative of the testimony.

The Court: Is there objection?

(Testimony of Henry Landsberg.)

Mr. Lyon: As illustrative of the testimony, no objection.

The Court: Received in evidence.

(The document heretofore marked Plaintiff's Exhibit 8 was received in evidence.)

Q. (By Mr. Christie): Mr. Landsberg, will you go through [245] Plaintiff's Exhibit 8 and explain to the court the derivation of your formula and whatever else you derived?

If it would help you, Mr. Landsberg, the blackboard is right there. If you want to illustrate your testimony on the blackboard, I am sure there is no objection.

The Court: You may.

(Witness at blackboard.)

The Witness: The diagram shown in Exhibit 8, or on this diagram there are two points at which air is being introduced, and one point at which it is being expelled, that is of interest to these tests.

The Court: These are computations made from the tests that you have just testified to?

The Witness: Yes, sir.

The Court: The tests made on the three- and four-foot Coleman heaters?

The Witness: Right, sir. And that is a procedure whereby the formula in computing these data was used. These are two points, then, at which gas is being introduced, and one point at which it is being expelled.

Q. (By Mr. Christie): From what, Mr. Landsberg?



(Testimony of Henry Landsberg.)

A. From the furnace or through the heat exchanger, the economizer, that is.

Now, we have designated one point as X, and the gas leaving the heat exchanger as V. If V is leaving and X is [246] the amount of gas entering at one point, then the other point must be V minus X. In other words, then, X plus V minus X equals V. That is, the gas entering at this point, and the gas entering at this point, equals the gas coming out at this point.

Algebraically, that of course cancels out, V equals V.

The Court: Does gas enter at both points, V and V minus X?

The Witness: Right, sir.

The Court: I mean X and V minus X.

The Witness: X is the gas that is moving up between the wall and the lower box.

The Court: And V minus X is the gas——

The Witness: Gas entering through the louvers on Exhibit 24-A at points 7 and 8.

The Court: That is the lower vent on the front?

The Witness: Right, sir. And V is the gas being expelled through the upper grille.

The Court: Which is the upper grille?

The Witness: Upper grille, yes.

Mr. Christie: Would it be clear, your Honor, if he identified on his diagram the points that he has already testified to with respect to the testing?

The Court: No; I am just attempting to make the record clear. [247]

(Testimony of Henry Landsberg.)

The Witness: Now, then, if we introduced a concentration of sulphur dioxide at point X, and that concentration were  $C_1$ , the concentration being quantity per unit volume, the the amount of sulphur dioxide that is coming in here would be X times  $C_1$ .

The Court: That is at point X?

The Witness: Right, sir. Likewise, if the concentration of sulphur dioxide entering at this point were  $C_2$ —

The Court: This point being the point V minus X?

The Witness: V minus X, then the amount here would be  $C_2$  times V minus X. In that the concentration is mass per unit volume. Therefore, the amount that is going through here would be this  $C_2$  times V minus X.

So, likewise, the amount that is leaving the furnace would be its volume times its concentration. That is, the gas coming through the upper grille, and that we will designate as  $C_3$ . So you might write that expression:  $C_1$  times X plus  $C_2$  times V minus X equals  $C_3$  times V. And that boils down to that expression (indicating).

The Court: Which is  $C_1$ —

The Witness:  $C_1X$  plus  $C_2 V$  minus  $C_2V$  equals  $C_3V$ . Or X times  $C_1$  minus  $C_2$  equals V times  $C_3$  minus  $C_2$ . And then X equals V times  $C_3$  minus  $C_2$  over  $C_1$  minus  $C_2$ . [248]

The Court: You are just reducing the equation.

The Witness: Yes, sir. What I am trying to

(Testimony of Henry Landsberg.)

prove here is this: The relation of XV can be determined without knowing either X or V, but by merely using the concentration of each of those points.

The Court: You have two unknowns in your equation.

The Witness: Right, sir. And the relation of X to V, the proportion of V—that is, X can be determined by knowing these concentrations.

Q. (By Mr. Christie): Mr. Landsberg, have you in your tests—did you measure the concentrations at the points that you have identified as V, X and V minus X?

A. Yes, sir. X is represented on Exhibit 5 by the points 1, 2, 3 and 4. V minus X is represented by the test points 7 and 8; and V is 5-A, 5-B and 5-C.

Q. Proceed with the description of your computations, Mr. Landsberg.

A. That is the extent of the computation for the time being, but——

The Court: SO<sub>2</sub> on the second page of Exhibit 8 means sulphur dioxide?

The Witness: Right, sir.

Now, as I mentioned before, the Titrilog records the current which is generating bromine. The bromine concentration is directly proportional to that current as per Faraday's [249] law. The quantity of SO<sub>2</sub> present in the incoming sample to the Titrilog is directly proportional to the quantity of bromine being generated above the zero level, and therefore

(Testimony of Henry Landsberg.)

directly proportional to the recorded bromine generating current.

Now, on the Titrilog—the Tritrilog actually measures the mass of sulphur dioxide in the incoming sample. However, the volume of the sample that is going into the Titrilog is maintained at the constant level by a critical flow orifice. So, therefore, since the volume is constant for all samples, then the quantity of sulphur dioxide determined as—or directly on the record, the generating current is therefore a direct—is directly proportional to concentration in each case.

The Court: The volume always being the same; volume always being constant?

The Witness: Yes, sir. Now, regarding any temperatures which might affect these tests, if the temperature of the sample varied in the quantity of sulphur—then the actual volume of the sample entering the Titrilog cell, based on standard conditions, would be less in one case than in another. That is, at the elevated temperature. And therefore the quantity of sulphur recorded would be less.

The Court: Your volume would not be constant.

The Witness: Right. However, the specific heat of gas [250] being so low that by the time it is conducted through a test tube, tube which is bringing the sample to the Titrilog, two or three or four feet, that gas has come to equilibrium with the ambient atmospheric temperature. So you do have a constant temperature for sample. Therefore, you do have a constant volume there. Your bromine gener-

(Testimony of Henry Landsberg.)

ating current is proportional to concentration in each of the test points, and so we do know our  $C_1$ ,  $C_2$  and  $C_3$  at each of these points.

The Court: Does Faraday's law require that the amount of the gas generated be directly proportional to the quantity of generated current?

The Witness: Right, sir.

Mr. Lyon: I couldn't quite hear that question. Could I have the reporter read it?

The Court: Yes. Would you read it, Mr. Reporter?

(Record read.)

The Witness: Now, on the two tests that were performed, we have established this formula, then, that  $X$  equals  $V$  and  $C_3$  minus  $C_2$  over  $C_1$  minus  $C_2$ —and on the 4-foot furnace  $C_1$  was 60, 57—these are the points 1, 2, 3 and 4—60 and 11, for an average of 47.

$C_2$  was 7 and 7 for an average of 7.

Q. (By Mr. Christie): What points were those, Mr. Landsberg?

A. Those were points 7 and 8. [251]

And  $C_3$  were points 5-A, -B and -C.

The Court: 7 and 8 is the lower front vent, isn't it? The lower vent?

The Witness: The louvre.

The Court: Yes. I call it a vent. The lower louvre.

The Witness: Right.

The Court: Out of which air comes.



(Testimony of Henry Landsberg.)

The Witness: At this point air is actually going in.

Mr. Christie: You are referring to Plaintiff's Exhibit 24-A?

The Witness: 24-A. And  $C_3$ , which represents the upper grille, which gas is being expelled from, and those points were 5-A, -B and -C, and the readings were 37, 16 and 36, for an average of 30.

Then using the averages in this formula, then we have 30 minus 7 over 47 minus 7, times V equals 23 over 40—or .575V. In other words, the volume X is  $57\frac{1}{2}$  hundredths of V or 57.5 per cent of V.

The Court: What came out——

The Witness: Of the upper?

The Court: ——upper grille was  $57\frac{1}{2}$  per cent in concentration for sulphur?

The Witness: No, sir. The sulphur concentration of what came out of the upper grille is  $C_3$ . That's an average of 30. [252]

The Court: Whatever that concentration was, 57.5 per cent of it came out of the upper grille? Is that it, of what entered X?

The Witness: Well, the volume?

The Court: Yes.

The Witness: The volume was composed of  $57\frac{1}{2}$  of V,  $57\frac{1}{2}$  per cent of V is X, in order to get this concentration at V.

The Court: Where is V? What is your point V?

The Witness: V is points 5-A, -B and -C.

The Court: The upper grille?

The Witness: The upper grille.

(Testimony of Henry Landsberg.)

The Court: Yes: I understand it now.

Q. (By Mr. Christie): Mr. Landsberg, related to the actual equipment tested, what per cent of gas came up the back and sides of the furnace?

A.  $57\frac{1}{2}$  per cent.

Q. How much came in points 7 and 8?

A. The difference, which would be  $42\frac{1}{2}$  per cent.

The Court: Points 7 and 8 being the lower grille.

The Witness: Points 7 and 8 being the louvres at the lower box on Exhibit 24-A.

Q. (By Mr. Christie): And what was the total percentage coming out the upper grille of this 4-foot exchanger? A. That would be 100 per cent.

Q. Now, have you placed these figures and this calculation that you have just testified to on Plaintiff's Exhibit 8 for identification? Is the calculation that you just made on the blackboard shown in Plaintiff's Exhibit 8 for identification? And, if so, where?

A. Right, sir. The calculations of this particular test are on page 5, designated furnace with 4-foot heat exchanger.

Q. At the top of the page?

A. At the top of the page. And a similar calculation is made at the lower portion of this page designated by furnace with 3-foot heat exchangers.

Q. Will you run through that calculation, if you will, please?

Mr. Lyon: I will agree he made it the same way he made it on the other one, and he came out with this answer.

(Testimony of Henry Landsberg.)

Mr. Christie: That will save some time, your Honor. We will agree to that stipulation.

The Court: As I understand it now, of the air emitted from the upper grille of the 4-foot furnace, 57½ per cent of it, the source of that was the back of the lower box.

The Witness: Right, sir.

The Court: 42½ per cent of it came from the lower grille in front?

The Witness: Right, sir. [254]

The Court: Now, on the 3-foot, using the same method of computation measurement, and computation, what are your figures for the 3-foot furnace?

The Witness: 22 per cent came from the back of the box. Now, that could be 22. This is a—the points 7 and 8 came out to be 5 and 4. In my computations here, in order to be conservative, I used 5. And therefore the concentration of the air coming up the back was 22 per cent. If you had used 4, it would be 24 per cent. And actually an average should have been used, which would be 23 per cent.

The Court: 22 or 23 per cent of the air emitted by the upper grille of the 3-foot furnace, Coleman furnace, came from the back of the lower box?

The Witness: Right, sir.

The Court: And 78 per cent came from the lower grille in front?

The Witness: Right, sir.

Q. (By Mr. Christie): Points 7 and 8, Mr. Landsberg? By the lower grille you mean points marked 7 and 8 on plaintiff's Exhibit 24-A?

(Testimony of Henry Landsberg.)

A. Yes.

Q. Have you completed your testimony with respect to the test computations that have been marked Plaintiff's Exhibit 8 for identification?

A. Yes, I believe that about covers it. [255]

Mr. Christie: I ask that they be marked in evidence as Plaintiff's Exhibit 8.

Mr. Lyon: Illustrating the witness' testimony only, your Honor.

The Court: According to my notes, they are in evidence. Exhibit 8 is in evidence.

Mr. Christie: I am sorry.

The Court: If not, it is now received.

Q. (By Mr. Christie): Now, in these computations which are represented by Plaintiff's Exhibit 8, you actually used the concentrations which were detected by the Titrilog in the tests that you made on these 3- and 4-foot economizers, is that correct?

A. Right.

Q. Now, Mr. Landsberg, can you tell us something about the accuracy of the test equipment that you employed, if you know?

A. Yes. The Titrilog is being widely used in industry, and the accuracy is of course a very important factor in how useful the instrument is. So the Titrilog, in order to read, to yield a concentration figure from the recording which is the generating current, a factor has to be applied. That factor is obtained by calibration. And the stability of that factor determines the accuracy of the Titrilog.

Since this was of utmost importance in the use

(Testimony of Henry Landsberg.)

of the instrument [256] by industry, the stability of these calibrations were determined by running four instruments constantly for a period of a month, and periodically, every 18 hours to be exact, it was so connected up that every 18 hours automatically a gas of known sulphur concentration was introduced into the instrument, and thereby establishing a calibration automatically. That test was carried on for a full month on four instruments, which were given no more than the usual maintenance that an instrument in the field would be given. And then that same test was repeated a second time for another month. And the results are tabulated in the paper.

Q. Plaintiff's Exhibit—

A. Plaintiff's Exhibit 4, I think it is, on page 1425. And that shows that if the Titrilog is calibrated daily, 90 per cent of the calibrations will fall within 3 per cent of one another. If the Titrilog is calibrated on a weekly basis, 90 per cent will fall within 7 per cent; and so on. That's, I think—is that sufficient?

And done every half a month and month, it seems that the calibration, the accuracy or the variation levels off so that the two are practically the same; and 90 per cent of the readings or calibrations will vary no more than approximately 11 per cent.

Q. Now, did these calibration figures enter into the calculations that you testified about? [257]

A. The calibration—we made no attempt to calibrate the Titrilog prior to the tests made on the fur-



(Testimony of Henry Landsberg.)

nace, since we were not after—oh, we had no interest whatsoever in the absolute concentration of the sulphur dioxide in the gas. All we were interested in was a figure which would indicate relative concentrations at each of the points tested. Therefore, no calibration was made. So the only point that is questionable, that is of interest, is how stable was the instrument from one reading to another. And since its stability is 3 per cent over a 24-hour period, you can practically assume that it is completely stable over the period of the test.

Q. How long a period did the test consume?

A. Oh, I think each test required about an hour.

\* \* \* \* \* [258]

### Cross Examination

Q. (By Mr. Lyon): Mr. Landsberg, what is the size of the samples that you took at these various points?

A. Approximately 1,000 cc.'s per minute.

Q. And how long did it take to secure one of these samples?

A. Well, the period that it takes to secure a sample can be practically instantaneous; however, we allowed it to sample for approximately five, I don't know, three to five minutes per point.

Q. It was five minutes, wasn't it?

A. Well, I wouldn't say it was five minutes. I think we can tell from the record.

Q. Can you determine from the record, from those charts?

(Testimony of Henry Landsberg.)

The Court: What exhibit are you examining?

The Witness: I would say approximately five minutes.

Q. (By Mr. Lyon): Mr. Landsberg, you took samples at the back of the inner box, such as Exhibit 24, between the plate of glass that was to represent the wall, and the back of the box, did you not? A. Right, sir.

Q. And those points were the points 2 and 3?

A. Right, sir. [259]

Q. In other words, there was a wall here right against—substantially against the back of the heater, wasn't there?

A. Well, I don't know. It wasn't against the back of the heater; it was back of it.

Q. It was approximately three-eighths of an inch deep, wasn't it, that area between the furnace back and the wall?

A. I am not sure of the distance.

Q. Did you ever measure the volume of gas that could be placed between the wall and the back of the heater?

A. No, I didn't measure that volume. I would say it was by far in excess of a thousand cc.'s per minute.

Q. You would? A. Yes.

Q. In other words, you weren't actually sucking gas up the back by means of this sampling technique that you used?

A. No, sir. The 1,000 cc.'s is equivalent to about 1/28th of a cubic foot.

(Testimony of Henry Landsberg.)

Q. Would you say that your testing technique would have any value if you were sucking gas up the back?

A. It would introduce air if we were sucking gas, or if the——

Q. Would you now please calculate the volume that can be contained in the back of this heater?

The Court: Do you mean in the annular space between the [260] back of the heater and the wall?

Mr. Lyon: That's right.

The Witness: That can be contained?

Mr. Lyon: That's right, what is the volume of the space back there?

The Witness: On the basis of the space between the wall and the——

Mr. Lyon: And the back of the heater that was approximately three-eighths of an inch.

The Court: Back of the lower box, is that it?

Mr. Lyon: That's right.

The Court: Which is Exhibit——

Mr. Lyon: 24.

The Witness: Well, I would have to have some dimensions.

Mr. Lyon: May I have that ruler, Mr. Clerk, please.

I will now measure the width of the space. It is approximately 13 inches, is it not?

The Witness: Yes.

Mr. Lyon: And the height is 50 inches, is it not? Or would you care to measure it? This is an 18-inch ruler.

(Testimony of Henry Landsberg.)

The Witness: Yes. We have 13 by 50.

Mr. Lyon: Yes.

The Witness: Do you mind if I rough this out at point 4?

Q. (By Mr. Lyon): You can rough that out. We don't need exact figures. [261]

A. 260 cubic inches.

The Court: In other words, there are 260 cubic inches of air space behind the back wall of the lower gas box, lower heater box?

The Witness: Yes.

Q. (By Mr. Lyon): That is cubic inches, is it not?

A. Right.

Q. Now, will you convert that into cc.'s, please? It is 16.39, the conversion figure.

A. Conversion of what to what?

Q. To convert that to cubic centimeters or cc.'s.

The Court: Cubic inches to cubic centimeters?

Mr. Lyon: That is right. Multiply by 16.39.

The Witness: That is correct.

Mr. Lyon: How many cubic centimeters do you get?

The Witness: 4,261.

Q. (By Mr. Lyon): And our sample was taken in five minutes, so we took 5,000 cc.'s, did we not?

A. Right, sir.

Q. So we took more than was in the back of the box?

A. No, sir.

Q. You didn't?

A. You had flow.

Q. Yes, but in the period——

(Testimony of Henry Landsberg.)

A. You had gas constantly moving through there. [262]

Q. You withdrew in five minutes more than the total volume of it? A. No, sir.

Q. And in one minute you took substantially a quarter of the gas out of the back, did you not?

A. This is not a static system. Gas is flowing through here.

Q. But if you can remove a quarter of the gas in a given space for a test, certainly that gas is not running in its normal channel, is it?

A. The gas is moving through there continuously.

Q. Did you measure the rate of flow?

A. No.

Q. Do you know that there was any flow of any given volume?

A. No given volume. I know that was a volume.

Q. There was a volume, but you can't say that you weren't drawing a quarter of that gas out through your machine, can you?

The Court: Over what period?

Mr. Lyon: Over any period, of the gas passing through there.

The Court: What do you mean, out through the machine?

Mr. Lyon: When he put his sample tube up there, your Honor, as shown in Exhibit 29-E, he was removing at all times [263] at least a quarter of the volume in there.

The Court: Is that correct?



(Testimony of Henry Landsberg.)

The Witness: We were taking out at the rate of approximately a thousand cc.'s per minute. Gas is continuously flowing through there. Therefore, I can't say that we took one-quarter of the gas that was there, because the gas is continuously flowing. It is not a static system.

If that portion of the furnace were enclosed, and therefore contained the 4,200 cc.'s, then in one minute we would be taking out a quarter or 25 per cent of it.

Q. (By Mr. Lyon:) But you didn't bother to measure or determine in any way how much you were sucking out of there.

A. I know how much I was sucking out.

Q. I mean out of the total volume.

A. No, not out of the total. However, by sizes of space through which the gas is passing I assumed, without any question, that the percentage was extremely small, in that you have a cross sectional area here through which the air is flowing of .375 times 13.

The Court: Those are inches now?

The Witness: Those are inches. That is a considerably larger cross sectional area than the gas that is feeding—the Titrilog is flowing through.

Q. (By Mr. Lyon): How about the reduced pressure above the point that you sampled, and in your testing machine how [264] do those compare?

A. The reduced pressure where?

Q. Above the point that you sampled, and in your test machine.

(Testimony of Henry Landsberg.)

A. The pressure in the test machine is practically atmospheric pressure.

Q. How about the pressure that forced the gas out of the back of the furnace into the Titrilog, what was that?

A. The pressure that forced the gas from the furnace into the Titrilog?

Q. Yes.

A. That was atmospheric, in that the whole system was open to the atmosphere.

Q. All right. Then what was the suction pressure?

A. The suction pressure on the downstream side of the orifice that is pulling the sample, this orifice is about, I don't recall the exact size, it is not any larger than the—it is not near as large as the lead of a pencil, an ordinary pencil—the pressure on that side of the orifice is somewhat less than half an atmosphere.

Q. Half an atmosphere?                      A. Right.

Q. Approximately seven to eight pounds pressure that you were pulling that sample?

A. The pressure differential at that point across the [265] orifice, which is a considerable distance from the point at which we are sampling—in fact, it is on the other side of the titration cell.

Q. Didn't you testify at the time of the taking of your deposition that there was approximately two inches of mercury in the suction tube?

A. In the suction tube of the sample?

Q. Yes.

(Testimony of Henry Landsberg.)

A. If we put a restriction on it, it would pull to that. But it was open to the atmosphere.

Q. But that is the suction pressure that you were putting on the sample to draw it out of the back of the furnace?

A. No, I wouldn't say that that was the suction pressure which we were drawing the sample out of the furnace. I would say that the instrument, if necessary, is capable of pulling that. But with the sampling probe at the furnace open to the atmosphere, it is not pulling that type of vacuum.

Q. What causes the gas to go out of the back of the furnace into your sampling machine, if there is no suction?

A. I didn't say there was no suction. I said there wasn't two inches of mercury vacuum.

Q. Mr. Landsberg, if the concentration of  $\text{SO}_2$  varies during one of these tests, do your figures make any sense? [266]

A. We expect them to vary to a degree. How much variation are you referring to?

Q. All right. We took samples at the points 1, 2, 3, and 4 at the back of Exhibit 24, didn't we?

A. Right.

Q. And during the time we took those samples it took approximately a half an hour?

A. Well, let's say it does. I don't recall.

Q. Then you took samples at the points 7 and 8?

A. Right.

Q. Those took approximately 12 minutes, 10 to 12 minutes?           A. Roughly.

(Testimony of Henry Landsberg.)

Q. So we are now up to, from the time we took our first sample at the back, we have got 40 to 42 minutes, have we not, difference?

A. On the basis of those figures, I don't believe——

Q. Please answer my questions. You can explain later. Isn't it true that between those samples was 42 minutes?

A. There was a period of time, whether it is 42 or 30 I don't recall.

Q. Then you took three samples from point 5-A, 5-B, and 5-C on Exhibit 24-D, which is the outlet of the economizer, which took another 18 minutes or so minimum, did it not?

A. No, sir. [267]

Q. Well, each sampling took about five minutes, didn't it, and there was a period of time to allow the machine to come back to zero between each sample, was there not?

A. Yes; yes, sir.

Q. Now, at any time during that hour that it took to make those tests did you ever check the concentration of the gas going into this machine?

A. If I recall correctly, in order to prove that point we proceeded through the procedure that you just outlined, and then returned to points 1, 2, 3, and 4 to show that the concentration had remained fairly constant.

Q. You had an assistant, during the deposition, in these tests?

A. Right.

Q. What was his name?

A. Earl Percy.

Q. Harold Percy?

A. Earl Percy.

Q. During that time and throughout this entire

(Testimony of Henry Landsberg.)

taking of this deposition, and testing, was Mr. Percy not continually adjusting the flow into the machine?

A. Adjusting the flow of sample into the machine? [268]

Q. That is right.

A. Absolutely and definitely not. He had no control——

Mr. Lyon: I will read you the record then. Your Honor, seeing that the witness has made this statement, I will have to ask that I be given time to get the record at the noon recess to go on this point.

The Court: Very well.

Q. (By Mr. Lyon): Mr. Percy never changed the volume during these tests?

A. Never changed the volume of what, sir?

Q. Of the gas going into this machine.

A. No, sir.

The Court: By "machine," you are referring to the Titrilog?

Mr. Lyon: Into the furnace. No, into the furnace.

The Witness: Oh, I beg your pardon. I understood, when you say machine—we better get our nomenclature correct here.

Q. (By Mr. Lyon): Didn't Mr. Percy continually adjust the input of gas into your furnace set-up that you were making a test of by——

A. No, sir. He adjusted the flow of the sulphur dioxide into the tunnel at the beginning of the tests. And we made those tests. Then when we started to



(Testimony of Henry Landsberg.)

make the test on the second furnace, with the 3-foot exchanger, we noticed discrepancies and we started making adjustments and found that our bottle of  $\text{SO}_2$  had become depleted. That was the only time he made adjustments during the tests.

Q. Then you will admit that if the volume of  $\text{SO}_2$  going into the thing varies at any time, your readings would be all off?

A. No, sir. I will—that involves—they will vary, as our records show that it did not remain absolutely constant.

Q. But you don't—

A. But relatively so.

Q. But you don't know whether that concentration was ever remaining steady of any range, do you?

A. Within certain limits I do.

Q. But you made no tests?

A. That it was remaining steady?

Q. Yes.

A. The record shows how steady it was.

Q. How can it when you don't know what you put in? You made no tests to examine what you put into this machine.

The Court: By "into this machine," you mean—

Mr. Lyon: Into the furnace.

The Witness: We adjusted a flow through a capillary, and that flow will remain relatively constant over the period of time that we operated it, as indicated by the record of the [270] Titirlog. How could the record of the Titirlog remain fairly constant?

(Testimony of Henry Landsberg.)

Q. Now, if there was any foreign  $\text{SO}_2$  put into the box at the bottom of the furnace, wouldn't that change your rating?      A. Any foreign  $\text{SO}_2$ ?

Q. Not coming out of the box—out of this bottle.

A. Frankly, we don't care where it is coming from. We just wanted to know how much there was there.

Q. In other words, you wanted to get a certain figure up here so you adjusted the volume control to get it, didn't you?

A. I wanted to get a certain figure where?

Q. Anywhere.

A. I don't believe I understand that question.

Q. Didn't you adjust the control of the volume of gas going into the furnace, the  $\text{SO}_2$ , so as to get the figures you would want?      A. When?

Q. At any time during these tests.

A. During the tests?

Q. Yes.

A. After the  $\text{SO}_2$  rate of flow out of the bottle was set at the beginning of the test, it was not touched again for the entire test of that one furnace. [271]

Q. Now, Mr. Landsberg, at my insistence, did you not make a check on the volume entering the furnace, on the concentration of gas entering the furnace?      A. Yes.

Q. And what was that concentration?

A. As I recall, the reading was a gross of 60, which would be a net of 47, since we had a zero level of 13.

(Testimony of Henry Landsberg.)

Q. And yet you have an average reading of the entire concentration that's the same reading, do you not, at the back of the furnace as at your input?

A. Yes.

Q. In other words, there is no air enters this furnace different from which you got down here at the inlet, is there? A. No.

Q. And you got a test of 47 back here (indicating)? A. Average.

Q. Yes. Now then, air does come up—I mean the gas coming in down here at the bottom does come in up around and out these vents 9 and 10, doesn't it? A. I believe some air does, yes.

Q. Did you make tests to find out what the concentration coming out there was?

A. No, we were not interested.

Q. In fact, you are not interested in anything but [272] the figures that you can use, and you don't care how you arrive at those figures, do you?

A. That is what you say.

Q. Well, I am asking you the question.

A. I certainly do.

Q. All right. Did you check the flow out the main grille here? That's the same air that enters the back, isn't it? A. Yes.

Q. And what were those figures?

A. I don't recall actually—I don't recall whether we checked them or, if we did, what the readings were, because that gas is essentially the same as what we test at points 1, 2, 3, and 4.

Q. Isn't it a fact that that gas was way down

(Testimony of Henry Landsberg.)

in concentration from what you were getting in the back when you made the tests?

A. We made our series of tests, went through all the points and made our series of tests, then you requested that we test through a hole in the tunnel in front of the intake grille. At that time the concentration was beginning to be a little bit lower. And shortly after we switched to the other furnace, and we found that the concentration was changing. Investigating that—which more or less proves that we know how steady the SO<sub>2</sub> input was, because as soon as it started [273] varying we immediately started investigating—we knew when it was varying, and we investigated why, and we found that our source of SO<sub>2</sub> was going dry. But that was a period after the complete test was made on the first furnace.

Q. If that is true, how can you get anywhere in this lower box a different reading than the input? You have no other source of air or gas, have you?

A. No.

Q. Therefore, coming out here should have been the same as going in the bottom, shouldn't it?

The Court: Coming out where?

Mr. Lyon: Coming out of the main grille of Exhibit 24-A. That's the part I am pointing to, and where the ticket is written and tied to. It should be the same as in back, shouldn't it?

The Witness: It should be if our source of SO<sub>2</sub> were not being depleted.

Q. (By Mr. Lyon): We'll admit that it is not being. You said it wasn't being. Now you have got

(Testimony of Henry Landsberg.)

a discrepancy from 11 to 60 on your back, on your own reading.           A. Yes.

Q. Wasn't that because you were varying the input, or the only way you could get a discrepancy?

A. No, sir. The point at which we got 11 was on the side there.

Q. How do you get the gas up the side then except [274] through the front?

A. There's a question of thorough mixing, and that portion at which the sample, the low concentration sample was taken, I think there is a block there and the flow was not as free as it was up the back. And therefore there was a good chance that the air and the  $\text{SO}_2$  was not thoroughly mixed at that point.

Q. How do you know that it was thoroughly mixed at any point?

A. That is the reason we did not—the Titrilog—with the Titrilog a test can be made in not much more than maybe 30 seconds. But in order to determine that, that is the reason we ran these tests, each point, for several minutes.

\* \* \* \* \* [275]

Q. Mr. Landsberg, do you know what ordinary stack pressure in these devices is, such as the heaters in this case?           A. No, sir.

Q. Now, before lunch I asked you if you had testified as to what the suction of this tube was. Have you looked over your testimony since?

A. The suction of the Titrilog tube?

Q. As it takes it out of back of the furnace.



(Testimony of Henry Landsberg.)

A. I haven't looked any further than what I stated before.

Q. You say that that is substantially nothing?

A. It may be in the order of one or two inches of water. [276]

Q. Is that greater or less than the suction in the furnace itself that causes the drafts through the furnace?

A. I don't know.

Q. You didn't bother to find out?

A. No, I didn't find out.

Q. Now, Mr. Landsberg, the only concentration of  $\text{SO}_2$  that can enter one of these furnaces, with your test, is by means of this opening at the bottom in this main grille here (indicating)?

A. Right, sir.

Q. And then anywhere in this furnace they should have the same concentration of  $\text{SO}_2$ , should they not?

A. Not necessarily. The same as what?

Q. The same as you put in down here.

A. Yes. Except there is a possibility that the gas as it enters there is not thoroughly mixed yet.

Q. That is possible, that the concentration in the back isn't mixed, too?

A. It is possible. However, by waiting as long as we could the chances of it being thoroughly mixed are better; and the fact that by testing there for periods of time, and the record remaining relatively stable, it indicated that the concentration was stable.

(Testimony of Henry Landsberg.)

Q. Now, will you explain how you can get a concentration at one point that is five times greater than at another [277] point?

A. It is possible in that the gas has not been—the  $\text{SO}_2$  has not been thoroughly dispersed in the gas that happened to enter that particular point, in that there might be some stratification as the gas enters the lower portion. [278]

Q. Now, can you explain to me how you can get a greater concentration at any one of these points 1, 2, 3 and 4 than you had at the inlet?

A. The reading at the inlet is not thoroughly, as thoroughly reliable as the one—those at the back, in that the longer you wait, allow the gas to travel, the more thorough the mixing.

Q. But you did get a lower reading at the input than you did up in the back, didn't you?

A. We got a lower reading at the input after the tests, a long series of tests had been completed. And immediately following that test, when we started the second test on the 3-foot furnace, with the 3-foot economizer, there was a continuation of that dropping in concentration, which immediately proved out to be the fact that the source of  $\text{SO}_2$  had become more or less depleted.

Q. Now, you also took tests, did you not, of the  $\text{SO}_2$  concentration right down here underneath at the bottom of the inlet into the space between the back of the furnace and the wall, did you not?

A. Yes. The tube there was introduced, though, just a very small amount into that space.

(Testimony of Henry Landsberg.)

Q. And what was the reading then?

A. The reading was, as I recall, very low; if anything at all. [279]

Q. And again you hadn't checked the input?

A. Hadn't checked what input?

Q. The input into the machine, into the furnace, to determine whether or not you still had the same concentration at the input.

A. Yes. I believe we did come back to the input. I don't recall the exact sequence as to how those points were taken, but we did take tests, for instance, as to points 1, 2, 3 and 4; go through some other testing and come back to points 2 or 3, and noted that the concentration was relatively the same.

Q. Now, how did any other gas get in down at the bottom here so as to dilute that SO<sub>2</sub> down there?

A. I really don't know, other than the fact—I don't know if any other gas got in there, but again there is the possibility that could have been stratification. Also that there was a dead space there and no mixing, because the sample tube was just barely penetrating the wall at that point.

Q. Now, when we made the smoke tests at the same time as these others, did you not see gas coming from these openings, 9, on Exhibit 24-A, and spilling over into 7, or from 10 and into 8?

A. I recall seeing gas spill out of the points, I think. What are they, 9 and 10?

Q. That is right. [280]

A. I am not sure that I saw gas spilling into 7 and 8. Although I assume some of that gas did get

(Testimony of Henry Landsberg.)

into those two points. And that is the reason we took into consideration the concentration of the  $\text{SO}_2$  in the gas entering those two points.

Q. Now, why did you choose these points 1, 2, 3 and 4 on the back of here?

A. Those points were chosen because we had initially introduced the  $\text{SO}_2$  through the tunnel. We then checked the point—the gas, flue gas from the grille, upper grille, and we found that it had a relatively high concentration. The question then was where was the concentration coming from. The possibility was that some of it was getting in through points 7 and 8. We checked those points and found that some was getting in there but not near enough to account for the concentration in the gas coming out of the upper grille. Therefore, it had to be coming from another source. The only other possible source was up the back. So we tested there with the idea of testing as far up that portion of the furnace in order to get as stable a reading as possible.

Q. Now, why didn't you take some points down here (indicating)? You have got four here that vary widely. Wouldn't it have been better procedure to have taken a multiplicity of possibilities? [281]

A. On the back you mean?

Q. Yes.

A. We were trying to get the profile or cross-section of the concentration, and the longer the passage of this air and  $\text{SO}_2$ , the better the possibility that it was thoroughly dispersed. Therefore, we took

(Testimony of Henry Landsberg.)

it as far up as we could. If we had taken it down below, it is possible that those readings would have been just as good. Although, it also was possible that the concentration would not have remained as constant because of mixing.

Q. Then this proposition of mixing is actually what the thing determines; if it is mixed well it gives you a high reading and if it is mixed poorly, it gives you a poor reading?

A. Not necessarily. If it is not mixed well, there might be a fluctuation between a high and low reading, and the fluctuation might be rather large.

Q. Well, when you took the reading down here at the bottom, at the inlet, did the readings fluctuate any more in proportion than they did when you took the readings at 1, 2, 3 and 4?

A. The reading down at the bottom, we hardly got any reading. And the only explanation I have for that is that the test—the tube through which the sample was being drawn was just barely into that space, and it is very possible that that [282] was a dead space, and the only air that was coming in was just by-passing that, and that air was not moving. It was of no great concern to us in that the experiment involved the passage of two sources of air in order to find out what the relative concentrations of those two sources were in the gas coming out the upper grille, and that point was not one of the sources. [283]

Mr. Lyon: Just a moment, your Honor. I want to see whether I am through or not.



(Testimony of Henry Landsberg.)

Q. (By Mr. Lyon): Now, did we not make a test of this  $\text{SO}_2$  content at the opening out into the attic, up here, for example, on top of these (indicating)? A. Yes.

Q. What was that reading?

A. I don't recall what the exact reading was. I think it was lower than the reading up the back. And that was very probably due to the fact that there is additional air entering from the upper portion of the grille, upper grille——

Q. But there was considerable——

A. ——and a dilution.

Q. —— $\text{SO}_2$  coming out, was there not?

A. I think, if I remember correctly, there was some, yes.

Q. If this  $\text{SO}_2$  stratifies, as you say, and runs in different concentrations up the back, why would it not be normal to use the highest concentration up the back to make the calculations, rather than an average from the one that is one-fifth off?

A. First of all, I am not claiming that it stratifies up at that portion of the furnace, in that the air and gas, the tracer gas,  $\text{SO}_2$ , have moved through a long passage, it has [284] been subjected to some warmer conditions in which case the  $\text{SO}_2$  can disperse more readily, and to use any one reading—the fact that that one was low seems to indicate that possibly that point, through that particular channel the motion of air wasn't very good. However, the idea is to get the average concentration going

(Testimony of Henry Landsberg.)

through there, so that it will be more representative.

If you recall the other three readings did not deviate very greatly, except for that one, and also on the second test, on the three-foot furnace, all four readings were quite similar.

Q. Now, you say it doesn't stratify in the back there up that high?

A. No, it wouldn't stratify. There might—

Q. Then if you have nothing else but a mixture of  $\text{SO}_2$  entering it, can you get a difference in concentration up here on one side or any other part, unless you have got stratification?

A. There is a possibility you might get some stratification below, because there are temperature differences, whereas as you travel up the back you have come to a pretty—all of the gas has come to an equilibrium temperature, whereas the gas coming up the side might have been from a different stratum and going up the back on that side, that side channel. [285]

Q. Now, the same thing, you have a very wide difference in reading in your readings coming out these points, you have very high ones at 5-A, 5-C, and 5-B you have almost half the concentration, now you can say that in one of those you can have a difference?

A. That gas is now mixing with another gas.

The Court: What do you mean by "now"?

The Witness: Well, sir, originally we have been speaking up till now of the mixing of the tracer,

(Testimony of Henry Landsberg.)

SO<sub>2</sub>, with the air that is going up the back of the furnace. Now the portion of this mixture, which is getting into the upper heat exchanger, now has to mix with the air that is coming in through points 7 and 8.

Q. (By Mr. Lyon): Well, I submit to you that this is true, that you should have figured and used the method of calculations that you did on your highest and lowest readings, instead of your lowest and highest as you have done.

A. I haven't used it on my lowest and highest.

Q. Why, you have used the figure 11 at the bottom and you used the figure 16 at the top.

A. No, sir. I used averages.

Q. Yes, but that certainly gives you way below your mean. If you throw in one small figure—you take test points of a dozen or more on a machine here, and you get one out of line like that, you usually throw it out, don't you, [286] in any mathematical calculation, that that is a faulty reading?

A. You are referring to repeating a test at one point. If we had made four tests at one point, and one was way out of line, according to mathematical calculation, we would have thrown that one out. But this is not a repeat of one point.

Q. Have you ever repeated this test that you have testified to?

A. Yes, we did that several times, with approximately the same results.

Q. What figures did you get?

(Testimony of Henry Landsberg.)

A. I don't recall the exact figures, but all within the same order of magnitude.

Q. You always got this same drop-out on one side and in the center?

A. I don't recall whether we did or didn't.

Q. Have you the figures for those tests around?

A. I haven't, no.

Q. Now, you have testified that on the tests on the four-foot economizer, at the closing of your test you discovered the gas in the bottle was running out, didn't you?

A. We hadn't yet.

Q. Was it?

A. It had perhaps just begun, because it wasn't really [287] evident until we set up and adjusted and started making tests on the three-foot economizer, during which time a considerable amount of  $\text{SO}_2$  had been going out of the bottle. However, in going back and testing in front of the tunnel or in front of the inlet in the tunnel, it was somewhat lower, not drastically lower, than the concentration up the back, so it appears that it had just begun to start going dry. Understand that this bottle has fairly high pressure on it, and even after it is beginning to deplete it can still go for some time before it really shows a small amount.

Q. You don't know, then, when you made your tests up at the second—up at the top of the economizer, whether the gas supply was getting weak, or not, then?

A. It couldn't have been very weak, because after we completed that test, and then came back

(Testimony of Henry Landsberg.)

and tested in front of the inlet, it was still quite high.

Q. Wasn't it a fact that it was off approximately over a fifth lower than the concentration in the back of the machine?

A. The net reading in back of the machine was, I think, an average of 47; the net reading in front of the inlet was, I think, 43. Now, no, excuse me; 47, too.

Q. To refresh your memory, the highest concentration you got in back of the machine was 60, and at the entrance it was 47. Do you care to have me read the record? You got 60, as you testified, up here, today? A. Yes.

Q. And 47 down here? A. Right.

Q. Now, how can you state that you could get a higher concentration of gas anywhere in this machine than you had at the opening end of the machine?

A. I think I have repeated this about three times now, that we are running the gas up the back from the bottle, we establish that concentration, we establish other concentrations, we made other tests, time went by, we then tested in front—the tests had been completed, we then came back at the request of Mr. Lyon and tested the concentration of the gas just as it is entering this inlet (indicating).

The Court: This inlet is what?

The Witness: The inlet to the lower portion of the furnace.

The Court: The furnace box?



(Testimony of Henry Landsberg.)

The Witness: The furnace box.

The Court: The front inlet, lower?

The Witness: Yes, sir. And that was somewhat lower than we were getting up the back. Shortly after that we moved over and started making our tests on the furnace with the three-foot exchanger. As we tested points 1, 2, and 3, we noticed that each one was subsequently lower than the previous [289] one. That immediately let us know that our source of  $\text{SO}_2$  was going dry. And sure enough in checking that, that was true. And we did not resume our tests until we had another source of  $\text{SO}_2$ .

Q. (By Mr. Lyon): Isn't it a fact that when you made your tests on the three-foot furnace after switching the matter over, the first two tests at the points 1, 2, 3, and 4—and I can't remember whether they were points 2 and 3 or 1 and 4—but when you made your tests there, they came out the same as after you got a new bottle of gas? It was only on the third or fourth test that you got any change?

A. Why don't we look at the record? [290]

Q. I am asking your testimony of the thing. If you have a record, check it.

A. My memory may slip me, whereas the record will speak for itself.

The Court: Do you have the record?

The Witness: Yes, sir.

The Court: You may refer to it. What is the record?

The Witness: Exhibit 6.

The Court: Very well. You may refer to it.

(Testimony of Henry Landsberg.)

The Witness: The beginning of the record—the record shows that the points were tested in the order of 1, 2 and 3. In setting up the point that was taken in front of the instrument to the furnace, when we get a reading of a net of 47, which was somewhat lower than what was gotten at the back, we had no idea of why that happened. Then we moved over to the other furnace and started testing. In starting testing the other furnace we made adjustments on the valve on the bottle that contained the  $\text{SO}_2$ . We adjusted it by opening it to start to give us an appreciable reading on the chart. We didn't care where, but just a good reading. So we opened it and we got a reading of 60—that's a gross reading of 60—so that the concentrations of this test would be in the same order of magnitude as those in the first test. We opened that to give us the 60 so as to have that type of concentration.

But by opening it, the bottle depleted that much more [291] rapidly, and you can see that points 1, 2, 3 and 4 are successively smaller. The fact that we got on the first point that we tested, that it gave us the same reading as it did later when we had a full bottle, that is merely a matter of adjustment.

Q. (By Mr. Lyon): That is my point, Mr. Landsberg. You adjusted that bottle every time you made a reading, during that test, didn't you?

A. You were there. Why did you allow that?

Q. It was your test, not mine. I always claimed it was faulty.

A. We never adjusted the bottle other than at

(Testimony of Henry Landsberg.)

the beginning of each test. It was adjusted when we moved it, because it was adjusted—well, as I said before, we adjusted the bottle and started a series of tests. That bottle was not touched during the running of a series of tests; never.

Mr. Lyon: That is all of this witness, your Honor.

The Court: Any redirect examination?

Mr. Christie: Your Honor, I was not present at the time that these tests were made. I wonder if you would have any objection if Mr. Hoegh asks the questions on redirect?

The Court: No, he may. [292]

### Redirect Examination

Q. (By Mr. Hoegh): Mr. Landsberg, directing your attention to Exhibit 5, which is the large cross-sections of the heaters, would you indicate where the position of the tube was which Mr. Lyon asked about as being underneath the back of the furnace?

A. Shall I mark it?

Q. Yes.

A. As near as I know, it was back in this corner (indicating).

The Court: What legend do you wish to put there? "Tube"? Has that legend been used?

Mr. Hoegh: We are using numbers for the sampling points, your Honor. We are using that point as "just under the burner," I believe it was described during the deposition. It was not used on the basis of this calculation, when it was made. It

(Testimony of Henry Landsberg.)

is one used when Mr. Lyon asked that certain test points be marked.

The Court: The figure 1?

Mr. Lyon: Just "under the burner" is the way it is referred to in the deposition.

The Court: Very well. Will you write "under the burner" there?

The Witness: All right, sir.

Q. (By Mr. Hoegh): Mr. Landsberg, would you explain [293] why you know there were dynamic conditions existing in the air at the back of the box?

A. Well, first of all, in using some smoke tests, in making some smoke tests, that is, we introduced a tracer which was visual, you could see the smoke moving up. Secondly, the fact that in testing, the gas coming out of the upper grille, the concentration of  $\text{SO}_2$  was appreciably greater than that which was coming in through points 7 and 8, and therefore had to come from another source; the only other source being up through the back. And therefore there must have been flow.

Q. During the examination of Mr. Lyon, I believe he suggested to you that the time for each test point was five minutes. Would you go through the record, please, and read just what the time for each test point was?

A. Yes. The recorder which records these, makes these records, has a two-speed system on it.

Q. Which exhibit are you referring to now?

A. Well, I haven't—I will be referring to Exhibit 6. Under normal operations, that is, the Tit-



(Testimony of Henry Landsberg.)

rillog as it is used in practically all applications that I have been familiar with, the chart speed is set so that test units as they are marked on the side of the chart of Exhibit 6, 1, 2, 3, and so on, are hours. However, we used the high speed on this test in order to show the slight fluctuations or emphasize [294] them, and the chart speed is such that the hours are now minutes. Therefore, the times that I think Mr. Lyon mentioned about an average of about five minutes per test is off by about a factor of 2, in that, for instance, in the first test point—

Q. Which test was that?

A. On the 4-foot furnace. Test point No. 1 was run for approximately two and a half minutes. Test point No. 2 was for approximately 2 minutes, including a recheck on the zero. Test point No. 3 was approximately two minutes. Test point No. 4—well, then there was zero for approximately one minute, and test point No. 4 was for about two minutes. Then we rechecked test point No. 1 for a period of about a minute and a half.

Incidentally, there's a pretty good check between test point No. 1, at the beginning of the test, and test point No. 1 now.

Then we tested test point No. 5-A for a period of a minute and a half, including the zero; 5-B about a minute and a half; 5-C for perhaps two minutes. And then we made another test with no funnel at 5-C for about two minutes.

Test point No. 7 was tested for about three minutes. Test point No. 8 about 5½ minutes.



(Testimony of Henry Landsberg.)

Q. Does that complete the series of the tests?

A. On the 4-foot economizer, yes, that completes the [295] test.

Q. Would you explain what the next test in the sequence of the record is, please?

A. Then we tested points—the next on the record here?

Q. Yes, on the record.

A. What we called points 1-X and 2-X—or X-2, rather.

Q. What were those?

A. Those points were the concentration of the gas coming out of the grille on Exhibit 24-A below points 7 and 8. Then we made the test under the burner, which showed very little. Then we tested the point of what we called point 11, which was in the tunnel just as the gas entered the box. And then we made various points on the flue, and so forth, outlet to the attic, for several minutes. And then we started our second set of tests in which we adjusted the bottle again to give us a reading up around 60 or 70, so that the tests would all be in the same order of magnitude. But the concentration as we got to 2, 3 and 4 was dropping.

Q. What is the next sequence of tests after that where the bottle was dropping?

A. Pardon?

Q. What is the next sequence of tests after the bottle was dropping?

A. Well, we did check 5-A and -B and -C at that

(Testimony of Henry Landsberg.)

time, [296] and that, too, was dropping, was lower than normal—than it had been, rather.

Then we waited and got a new bottle and again set the bottle to read around 60. And then the bottle was left there and point 1 was tested for approximately two and a half minutes.

Q. Which heater are you referring to now?

A. This is the heater with the 3-foot exchanger. Point 2 was tested for approximately two minutes. Point 3 was tested for about two and a half minutes. Point 4 was tested for approximately two minutes, including a zero check. Point 5-A and a zero took about two minutes. 5-B about a minute and a half. 5-C about a minute and a half. Point 7 about two minutes, or two and a half minutes. Point 8 approximately 3 minutes. And we rechecked point 2 again for about two and a half minutes.

And that was that series of tests.

Q. Now, Mr. Landsberg, what instructions were given you when you were asked to set up these tests?

A. Well, about the only instructions——

Mr. Lyon: That is objected to as hearsay, your Honor.

The Court: Overruled. It is offered for the purpose of, I take it, showing the instructions under which the agent acted.

Mr. Hoegh: Yes, sir. [297]

The Court: You may answer.

The Witness: I was asked if we had a means of determining how much, if any, of the gas that was

(Testimony of Henry Landsberg.)

coming out of the upper grille came up the back of the furnace. At first I thought that we would use a mass spectrometer for this purpose, and use a tracer gas, some other tracer gas. However, the only one that was feasible would have been helium. Helium is considerably lighter than air and it might have traveled independently of the air and given questionable results, in favor of the test you might say.

So, we also have this Titrilog, this instrument, and it can operate on sulphur dioxide and much smaller concentration than the mass spectrometer. Also, sulphur dioxide is considerably heavier than air and therefore would not diffuse independently of the air, and we could operate with extremely low concentrations so that it would be insignificant as compared to the total flow. And so the Titrilog was used for this purpose. And——

The Court: What were your instructions? That is the question.

The Witness: The instructions were to determine how much, if any, of the air that was coming up the grille came up the back of the furnace.

The Court: Come up what grille?

The Witness: The upper grille. [298]

Q. (By Mr. Hoegh): The economizer outlet grille? A. The economizer outlet grille.

Q. I believe you read the record as to the sequence of testing points. Did you go back and check points 1, 2 and 3 after you had taken some records

(Testimony of Henry Landsberg.)

to see whether or not the values were fairly constant?

A. Yes. Beginning—we would go back—I have forgotten whether we go back to 1, 2, 3—but we went back to, I know, some of the points in the back, in other words, to determine whether the concentration was the same as we started, to see how constant it was staying.

Q. Would you calculate the percentage of the air coming out the economizer outlet grille that comes from around the back of the heater, using the highest values and the lowest values, for the 4-foot economizer?

A. This is on the 4-foot?

Q. Yes.

A. All right. I will use for  $C_1$  the highest, which is 60; and  $C_2$  has remained constant at 7;  $C_3$ , the highest would be 37; and  $C_2$  is the same, 7, which would be 30 over 60, or 50 per cent that  $X$  is of  $V$ , or the amount of gas coming out of the upper grille is—50 per cent of it is— $X$  is 50 per cent of the amount that is coming up the grille, as coming up the back, on the basis of these figures.

Now, if we used the lowest, then 60 becomes 11 minus 7, and this lowest was 16 minus 7. And that would be 8 over 4, and that would hardly be possible.

Mr. Lyon: That would be twice as much coming out as went in?

The Witness: Right.

Q. (By Mr. Hoegh): Will you take the lowest

(Testimony of Henry Landsberg.)

reading coming out at the top, that would be the economizer outlet grille, and the highest reading going up the back?

A. The lowest out the top?

Q. Yes.

A. Wait a minute. This isn't quite right here. Now, back up on the highest figures, I made a mistake here. That would be 53. That percentage would be close to 57 that we had originally. I am backing up to my original calculations on using the highest values.

The Court: The highest values show around 60 per cent of the area that came out the top of the grille originated behind the lower furnace box?

The Witness: Right, sir.

And using the lowest at the top and the highest at the bottom would be 8 over 53, which would be about 15 per cent.

Q. (By Mr. Hoegh): Did you make any tests of velocity coming out the discharge grille of the economizer, velocity of air? [300]

A. No.

Q. Did you observe any tests?

A. Yes, I saw some tests being made.

Q. Were they run under your supervision?

A. Well, I observed them.

Q. Who ran those tests, Mr. Landsberg?

A. Mr. Hollingsworth.

Q. With respect to the three-foot economizer, Mr. Landsberg, would you calculate the percentage of air coming out the economizer grille which originated around the lower box, using the highest



(Testimony of Henry Landsberg.)

figure of points 5-A, -B, and -C—rather, the lowest figure of points 5-A, -B, and -C, and the highest figure of points 1, 2, 3, or 4.

A. It would be about 22 per cent.

Q. I believe during your examination by Mr. Lyon you testified that you were not interested in the amount of air coming out through points 9 and 10; would you explain why those points are not of interest, or the amount of air coming out of there is not of interest?

A. Well, the gas—as we started out originally, the gas that is coming out, the air that is coming out of the upper grille is coming from two sources, that is, two possible sources, one of which we know for sure is 7 and 8, through the upper—this louvre on Exhibit 24-A, and then there is a possibility that there is air going up the back. [301] And there is no other means of other air entering into—there is no other source of air for this air that is coming out the upper grille. Therefore, it was our purpose to trace the air that possibly could get into that grille. And since this does not get into it directly, other than by perhaps coming back and going in through 7 or 8, what comes out there is of no significance to the tests. It is significant, though, if it gets back in this way (indicating).

The Court: By “this way” you mean—

The Witness: In through points 7 and 8. And, therefore, we tested those points to account for the pickup of sulphur dioxide in the air that is entering at that point.

(Testimony of Henry Landsberg.)

Q. (By Mr. Hoegh): During these tests was there any source of sulphur dioxide being injected into the tunnel than the SO<sub>2</sub> bottle which you used?

A. Was there any other SO<sub>2</sub>?

Q. Yes.

A. Being introduced into the tunnel, other than that which we introduced?

Q. Yes.

A. No, other than perhaps a very small amount that might have gotten into the room air. And that of course was all mixed up with the air in the tunnel, and would have been accounted for in our determinations at points 1, 2, 3, and 4.

Q. Did you make frequent tests of the sulphur dioxide [302] content of the room air?

A. We made frequent checks of the sulphur dioxide in the room air by periodically—I would like to back up on what I just said a minute ago, in that the amount of sulphur dioxide that might have been getting into this system from the room is automatically accounted for by the fact that we use that as our reference level, in that the zero on the instrument was established by pulling room air through the titration cell. So we were measuring everything over and above that which might be in the atmosphere in the room?

Q. How were the net readings derived?

A. The net readings were derived by subtracting that zero level, as we call it, from the gross reading, to arrive at the net readings.

The Court: Before each test run——

(Testimony of Henry Landsberg.)

The Witness: Right, sir.

The Court: —you established an equilibrium of zero?

The Witness: Right, sir. That remained practically constant throughout the test, but we still periodically checked it.

Mr. Hoegh: That is all, your Honor.

The Court: Recross?

Mr. Lyon: I have just a couple of questions, your Honor. [303]

#### Recross Examination

Q. (By Mr. Lyon): Mr. Landsberg, take the burner, Exhibit 24, and put it in approximately the position it is when the furnace is assembled.

A. This burner here?

Q. I believe that is the one you testified was used, did you not? A. Yes.

Q. Now, will you put that in its usual position?

A. I assume it goes in under here about like so (indicating). I have never taken it apart. With the burner up into this chimney.

Q. Would you say that that is in the correct position now?

Mr. Hoegh: I would like to look at the installation instructions, Mr. Lyon.

Mr. Lyon: Would you? Because I want this exactly where that burner belongs.

Mr. Christie: Your Honor, Mr. Hollingsworth can install it if Mr. Lyon has no objection.

Mr. Hoegh: It is Exhibit 26.

(Testimony of Henry Landsberg.)

Mr. Lyon: I don't know exactly. I think these gentlemen can agree.

The Court: Is it agreed now, gentlemen? [304]

Mr. Lyon: Mr. Hoegh or Mr. Christie, can we agree that this is the position the burner would be in when it was assembled for operation?

Mr. Hoegh: Yes.

The Court: By the burner you are referring now to Exhibit——

Mr. Hoegh: 24-C, your Honor.

Q. (By Mr. Lyon): Mr. Landsberg, you have testified here that when you put a tube in and called it under the burner, you merely stuck it in through the glass about so far (indicating), haven't you?

A. At the point that we measured down there?

Q. Yes. A. Yes.

Q. And that is what you have shown on Exhibit—I note you show this in here (indicating).

The Court: Figure A on Exhibit——

Mr. Lyon: 5.

The Witness: Exhibit 5, yes.

Q. (By Mr. Lyon): Now, actually was that tube not way in under the burner, in where I am now drawing a round circle that I will mark "X"?

A. No, sir. I think there was a misunderstanding. That was your intention of having us do that, I think I realize now. [305]

Q. I will read you the record, Mr. Landsberg.

The Court: Just a moment. Let the witness finish. Had you finished your answer?

(Testimony of Henry Landsberg.)

The Witness: As I was saying, I think that is the way Mr. Lyon intended us to do it, but there was some misunderstanding, and when we made the test it was not in all the way like that.

Mr. Lyon: All right. I will read you the record, Mr. Landsberg, and then see what you have to say.

The Court: Is this from the deposition of the witness?

Mr. Lyon: This is your deposition taken on July 26, 1954.

The Court: Let's place it before the witness. Let it be placed before the witness.

Mr. Lyon: Page 24.

The Court: What portion of it do you wish to direct his attention to?

Mr. Lyon: On page 24, your Honor.

The Court: What lines?

Mr. Lyon: I will refer you to line 19 on page 24.

The Court: Will you read it to yourself and let us know when you have finished?

Mr. Lyon: Continuing through to line 7 on page 25.

The Court: Have you finished reading?

The Witness: To page 27? [306]

Mr. Lyon: Page 25, line 7.

The Witness: Yes, I have read that.

Q. (By Mr. Lyon): And you still repeat that the tube only went in approximately a quarter of an inch underneath through the back?

A. I am going simply by memory now, because it says nothing here as to how far it was in, whether it was as you say or as I say.



(Testimony of Henry Landsberg.)

Q. Didn't you agree with me, when I said—I would like to read this to the court.

The Court: You are reading the portion heretofore indicated?

Mr. Lyon: Yes, into the record.

"Mr. Lyon: Will you try it? You are now going to make a test at a tube that goes in adjacent to the burner approximately—no, wait a minute now. Where would you describe that, Mr. Landsberg?

"A. Which one did you want? This one is coming in and up to here.

"Mr. Lyon: Where does this one go?

"A. Straight through.

"Mr. Lyon: Where to?

"A. Into the bottom.

"Mr. Lyon: Just under the burner? [307]

"A. Just under the burner."

The Court: Has that deposition been marked as an exhibit here?

Mr. Lyon: Not as yet, your Honor. I will place it in evidence later. Or I will offer it as Defendant's next in order now, if I may have the original from plaintiff.

Mr. Hoegh: The witness has it, Mr. Lyon.

The Court: Is there objection?

Mr. Christie: No objection, your Honor.

Are you offering the entire exhibit?

Mr. Lyon: I am offering the entire exhibit, and the exhibits attached thereto.

The Court: Has it been marked heretofore?

Mr. Lyon: It has not, your Honor.

(Testimony of Henry Landsberg.)

The Court: It will be received as Defendant's Exhibit V—would that be it, Mr. Clerk?

Mr. Lyon: No, your Honor. I believe it will be V. I thought you said B.

The Court: V as is very.

The Clerk: S, T, and U are all that the defendants have. From A to R there is nothing.

The Court: A to R is on the list attached to the pretrial statement filed October 22, 1954. So this will be Exhibit V. And the exhibits attached to the deposition will take the identification— [308]

Mr. Lyon: I think they are already in evidence, your Honor.

Mr. Hoegh: May I point out that the photographs, Exhibits 29, 29-A, 29-B, 29-C, 29-D, and 29-E are the photographs that were attached to Mr. Landsberg's deposition as Exhibits 2, 6, 7, 8, and 9, and that the furnace test records, which are Plaintiff's Exhibit 6, were attached to Mr. Landsberg's deposition as Plaintiff's Exhibits 3, 4, 5,—1, 3, 4, and 5, your Honor.

Mr. Lyon: That is satisfactory, your Honor.

The Court: I take it, then, the exhibits which are attached to the deposition Exhibit V, in so far as that deposition is concerned, will have the same identification as is set forth in the deposition, necessarily?

Mr. Lyon: That is correct.

The Court: But with this cross reference to the exhibits which duplicate them, which are now in evidence.

(Testimony of Henry Landsberg.)

Mr. Lyon: Yes.

Mr. Hoegh: Yes.

(The exhibit referred to was marked Defendant's Exhibit V, and was received in evidence.)

[See page 629.]

Q. (By Mr. Lyon): You have figured per cent. Taking the highest and the lowest in both positions, would you take the highest position in back on the No. 4 and the lowest position at the outlet of the economizer? [309] A. Which furnace?

Q. On the four-foot furnace.

A. Would you repeat that? The lowest——

Q. The lowest at the outlet of the economizer. What is that figure that you have?

A. The lowest would be 16.

Q. Right. And the highest at the back of the furnace? 16 minus 7, isn't it?

A. About 15 per cent.

Q. All right. Now, there is considerable difference between 15 and 57 per cent, isn't there?

A. Yes.

Q. Now, Mr. Landsberg, you also took readings at the outlet of the lower heater, which is where this tag is on Exhibit 24-A, did you not?

A. Yes, we took some readings there.

Q. And those net readings were 49 and 52, were they not?

A. I don't recall exactly, but in that order of magnitude, yes.

Q. Would you please check that, because I want

(Testimony of Henry Landsberg.)

it on the record. That would be points X-1 and X-2, would it not?

A. Right. We have here X-1 a gross of about 64, less 13, would be about 51 or 52; and at X-2 about 65 average, for a gross of 52. [310]

Mr. Lyon: That is all, if your Honor please.

The Court: Any further questions?

Mr. Hoegh: Yes, your Honor, if I may.

I would like to offer as an extension of the remarks which Mr. Lyon read into evidence the following portions of Mr. Landsberg's testimony. These relate to the same subject-matter to which Mr. Lyon was directing his attention.

The Court: It is all now in evidence.

Mr. Hoegh: I would like to clarify the statement that was read.

The Court: Do you wish to read a portion into the record at this point?

Mr. Hoegh: Yes, your Honor.

The Court: You may.

Mr. Lyon: What pages, please?

Mr. Hoegh: Page 91.

The Court: Commencing at line——

Mr. Hoegh: 4, through line 11. Mr. Lyon was interrogating the witness at that time.

“Q. How would you get any more? You measured right here at the only inlet under the burner to that back flue.

“A. That sample was taken at the very bottom one-half inch in.

“Q. No, I beg to differ. We ran it under the

(Testimony of Henry Landsberg.)

[311] burner, put it under here at the time it was made.

"A. No, no."

The Court: Is there anything further from Mr. Landsberg?

### Further Redirect Examination

Q. (By Mr. Hoegh): Mr. Landsberg, from the tests that you observed of the velocity of air coming out the upper discharge grille of the economizer, were you justified in taking an average of the readings at that point?

A. Yes, as I recall it was pretty constant across there.

\* \* \* \* \* [312]

Mr. Hoegh: The first is from the deposition of Mr. [313] Sheldon Coleman, deposition taken in Wichita, Kansas, on April 6, 7 and 8. The deposition marked as Plaintiff's Exhibit for identification number 9 contains the testimony of four individuals, Mr. Sheldon Coleman, Mr. Harry Giwosky, Mr. Jack Kice and Mr. Charles Taylor Gale. The questioning is by Mr. Christie at this point.

Mr. Lyon: What page?

Mr. Hoegh: On page 19. Unfortunately the reporters in Wichita don't number the lines. It is about a third of the way down the page.

"Q. Now, is this economizer one of the unusual features that you referred to in the annual report on page 15?

"A. Yes, I would say so.



“Q. Are you familiar with the Holly heater, which has a secondary heat exchanger, Holly being the plaintiff in this action?

“A. I am not familiar in extreme detail. I have seen the Holly unit. I am familiar, generally.

“Q. Would you know when you first saw one?

“A. No, I don’t believe I recall when I first saw one.

“Q. Can you tell me whether it was before or after you began the manufacture of this unit?

“A. It was before. [314]

“Q. It was before? “A. Oh, yes.”

Beginning on the second line of page 20—oh, I haven’t checked to see whether there have been any corrections made in this, Mr. Lyon. I am reading from our copy.

Mr. Lyon: Your Honor, why can’t we deem these read into the record and just submit the pages, and so forth. I don’t believe there is any reason to have to read this whole deposition into the record.

The Court: There is no necessity for it. However, counsel may proceed as he desires.

Mr. Hoegh: Your Honor, the reason for proceeding in this way is an attempt to keep the record down. We could mark the portions of the deposition to be copied by the reporter if you wish.

The Court: Are they extended?

Mr. Hoegh: No, sir.

The Court: Well, proceed.

Mr. Hoegh: I note there are no corrections on the portions which I have just read.

Now, the second line on page 20.

The Court: The next portion is commencing at the second line on page 20?

Mr. Hoegh: Yes, sir.

"Q. Does your organization have a group which [315] is known as the New Products Committee?

"A. Yes.

"Q. What is the function of the New Products Committee?

"A. Well, they are supposed to review the experimental work that is being done, to determine what new products the company wants to market. Also, they determine, at least in an advisory way to the president, the products we might work on experimentally.

"Q. Do you know whether or not it was a decision of the New Products Committee to go into wall heaters with economizers or secondary heat exchangers?

"A. Well, this should probably be understood. The New Products Committee in the Coleman Company is not an administrative committee; it is an advisory committee to the President.

"Q. Do you know whether the committee advised you to go into the manufacture of wall heaters with secondary heat exchangers?

"A. With our economizers?

"Q. Yes.

"A. Certainly, that's right, they did."

Now, turning to page 23, the third line from the top. [316]

"Q. Does the committee, when it advises you that it believes that it would be a good idea to make a

new product, the initial advice to you, is this greatly detailed or do they simply say in effect, 'We think it would be a good idea to put a secondary heat exchanger on top of our wall heater,' or how does this go, and what happened in this instance, if you know?

"A. As I explained initially, the problem of greater B.T.U. outlet from stud faces was common with the entire industry, and then the problem is what is the best way to do this, and many people have different ideas as to how to accomplish it. We work a great many and many are rejected, and the committee, which has some people from our sales organization on it, wanted a certain field result, and it was up to the design division to produce the best unit, after experimenting with many units, to accomplish this result.

"Q. Was this advice from your New Products Committee inspired by the Holly heater which you had seen prior to the time you went into the manufacture of your devices?

"A. I would say primarily not, but certainly the action of any competitor has a bearing and [317] influence on what we do, and I assume that we, too, would have an influence on our competitors."

I would like to turn now to the deposition of Mr. Harry Giwosky, which was taken later during the same time that Mr. Coleman's deposition was taken, page 106 of Plaintiff's Exhibit No. 9 for identification. It is the second line from the bottom on page 106.

"Q. Mr. Giwosky, when you designed the Cole-

man heaters, Nos. 64, 67, 68 and 69, had you seen a Holly heater with a secondary heater exchanger?

"A. Yes.

"Q. And had you seen the Holly patent, which is in issue here? Are you familiar with the patent?

"A. No, I am not too familiar with the patent. I don't understand too much about them.

"Q. Had you seen the patent at the time you made the design?

"A. No, I don't believe so.

"Q. But you had seen the heater?

"A. Yes.

"Q. That is, the one that has, what Holly refers to, the secondary heat exchanger?

"A. Yes. It is our practice to get all our competitors' heaters in; we make it a business to get every heater. [318]

"Q. Did any other heaters come on the market with a secondary heat exchanger?

"A. Not to my knowledge.

"Q. Holly was the only one?

"A. As far as I know, that is right".

That concludes the reading of those portions of that deposition, your Honor. I did not read the portions which identify the witnesses. However, I am sure Mr Lyon will agree that Mr Sheldon Coleman is the president of the Coleman Company and Mr. Harry Giwosky was chief design engineer for the Coleman Company.

Mr. Lyon: I will modify the last part. I will agree as to Mr. Coleman, but Mr. Giwosky was just one of the design engineers, not the chief.

The Court: Do you accept that stipulation, Mr. Hoegh?

Mr. Hoegh: Perhaps I'd better read Mr. Giwosky's identification of himself, your Honor.

Mr. Lyon: But Mr. Coleman, Sheldon Coleman, whose deposition he read, is the president and was at the time of the design of the defendant.

Mr. Hoegh: Would you stipulate Mr. Giwosky was the design engineer in charge of the project to design the Coleman wall heaters with the economizer?

Mr. Lyon: I will stipulate to that.

Mr. Hoegh: That will be satisfactory. [319]

I would like to mark for identification as Plaintiff's next in order Coleman Annual Report for 1952.

The Court: That will be Exhibit 10?

Mr. Hoegh: Yes.

The Court: Is it stipulated to be a true copy in all respects of what it purports to be?

Mr. Lyon: Subject to correction of error.

The Court: You offer it in evidence?

Mr. Lyon: I object to the materiality. I don't know why this is added to pad up the record.

Mr. Hoegh: The testimony of Mr. Coleman, which I just read, refers to a certain portion of it on page 11, I believe.

Mr. Lyon: You didn't read that into the record.

The Court: Do you wish to offer the entire report?

Mr. Hoegh: Yes, sir.



The Court: The objection is overruled. It may be received in evidence.

(The document referred to was received in evidence and marked as Plaintiff's Exhibit No. 10.)

[See Book of Exhibits.]

Mr. Hoegh: The particular portion to which Mr. Coleman made reference is on page 15 at the top, the description of wall heaters.

"New models just introduced have improved appearance and some unusual features that make for higher heating performance. The wall heater feats in the wall, uses no room space and heats one or more rooms. Multiple installations make it possible to enjoy zone heating at its best. They are especially popular for use in small homes, small apartments, tourist cabins, motels and as auxiliary heat in hard to heat rooms."

Your Honor, I would like to offer in evidence next two letters received by Mr. Christie from Mr. Horace Dawson. One is dated April 15, 1953, addressed to Mr. James B. Christie.

The Court: Is it stipulated to be genuine in all respects what it purports to be?

Mr. Lyon: Yes, your Honor.

\* \* \* \* \* [321]

The Court: Dawson, Tilton & Graham, attorneys for one of the parties here, or were they on April 15, 1953?

Mr. Lyon: Yes, your Honor.

The Court: Attorney for the defendant?

Mr. Lyon: They were.

The Court: The objection to the letter of April 15, 1953, is overruled. It will be received in evidence as Plaintiff's Exhibit 11.

(The document referred to was received in evidence and marked as Plaintiff's Exhibit No. 11.)

[See page 512.]

Mr. Hoegh: The next letter is dated June 4, 1953, addressed to James B. Christie, consisting of two sheets, signed on the second sheet by Horace Dawson, and attached to it is a drawing.

The Court: Is the document stipulated to be genuine in all respects what it purports to be?

Mr. Lyon: That is right, your Honor. Same objection.

The Court: That it was sent as a letter by the party signing it to the party addressed on or about the date it bears?

Mr. Lyon: That is right.

The Court: The objection is overruled, and it is received in evidence as Plaintiff's Exhibit 12. [322]

(The document referred to was received in evidence and marked as Plaintiff's Exhibit No. 12.)

[See page 514.] [323]

Mr. Lyon: I believe that the rest of the exhibit should be accompanied. This is only a fragment.

The Court: A fragment of the letter?

Mr. Lyon: It says, "I am also enclosing photo-static copies of advertisement of Metalbestos vent assembly," and so forth.

That is part of this letter, and it does not accompany this exhibit.

Mr. Hoegh: I would like to point out that that has been introduced in evidence, a similar copy has been introduced in evidence as Defendant's Exhibit S.

Mr. Lyon: All right, your Honor.

The Court: Is it stipulated that a copy of Defendant's Exhibit S was enclosed with the letter Exhibit 12?

Mr. Lyon: Was it?

Mr. Hoegh: Yes, it was.

Mr. Lyon: I will take counsel's word for it, your Honor, subject to correction.

The Court: Very well.

Mr. Hoegh: Pardon me, your Honor.

I would like to point out with respect to the exhibit, that the red markings on it, Mr. Lyon, were made at the deposition of Mr. Coleman.

Mr. Lyon: That is right, your Honor.

Mr. Hoegh: They do not represent a portion——

The Court: What exhibit are you referring to?

Mr. Hoegh: To the letter, I would say the enclosure to the letter, which is a drawing——

The Court: Which letter?

Mr. Hoegh: Dated June 4——

The Court: Exhibit what?

Mr. Hoegh: Exhibit 12.

The Court: The drawing attached as a part of Exhibit 12?

Mr. Hoegh: Yes, your Honor.

The Court: Your stipulation is that the red

markings thereon were made at the Coleman deposition, which is Exhibit 9?

Mr. Lyon: Yes, your Honor.

Mr. Hoegh: The red markings and the markings in ink, which are numbers with lead lines.

The Court: So stipulated?

Mr. Lyon: So stipulated.

The Court: Very well.

\* \* \* \* \* [325]

### JACK KICE

called as a witness by and on behalf of the defendant, having been first duly sworn, was examined and testified as follows:

The Clerk: Will you state your name, please?

The Witness: Jack Kice.

The Clerk: K-i-c-e?

The Witness: That's right.

### Direct Examination

Q. (By Mr. Lyon): Will you state your age and occupation, and by whom you are employed, please?

A. I am 40 years old, I work for the Coleman Company, Inc., Wichita, Kansas. The job probably requires a little explanation, because at the time of the depositions I was working—the job title that I had was assistant to the president, which would appear in the depositions, and since that time we have greatly expanded our application engineering section, and I have taken over the reorganization of that department and the service engineering department. My present job title is manager of the application engineering and service department. In this

(Testimony of Jack Kice.)

capacity I have charge of all technical matters for the sales department. That would include training and writing manuals, consultation with the design department, liaison between design and factory and [326] numerous other sections of the business.

I could probably summarize it by saying all technical matters for the sales department come under my general jurisdiction.

Q. Where do you reside, Mr. Kice?

A. I live in Wichita, Kansas.

Q. Would you give us the background of your preparations and training for the present position you hold?

A. Probably the most impressive thing about my background is the experience.

I have been connected with the heating and air-conditioning business, almost every aspect of it, for the past 26 years, starting from the time I was helper to a furnace installer at the age of 14, during the summers while I was going to school. That is what I did all through school. And of course I graduated from high school.

After working as a journeyman sheetmetal worker for a couple of years I went to Chicago Technical College, where I completed their course in air-conditioning engineering, it must have been 1935 or '36.

Incidentally, I stayed with the school to help them in the conducting of this training course for a couple of months.

I went back to Wichita where I worked as an



(Testimony of Jack Kice.)

engineer and a draftsman. I later became the manager of the—I should say I later became district engineer for the Frigidaire [327] distributor, covering most of the State of Kansas and part of Oklahoma and Missouri. This was about 1937. Excuse me. That would be about 1938 to 1940.

I then changed jobs and had a similar position with the York distributor in about the same territory, which I was in charge of their application engineering. From there I went——

Q. Just a minute. Does the York Company distribute heating and air-conditioning appliances?

A. Yes, the York Company is one of the two largest manufacturers of air-conditioning.

Incidentally, this distributor also handled Lennox equipment and several lines of allied products in the ventilation and heating field.

I went back to Marshalltown, Iowa, which is the home office of the Lennox Furnace Company, as assistant to the chief engineer, in 1940.

I left there in 1941 to return to Wichita—this was about August of 1941—where I was in charge of a section of the tool design department, which had to do with manufacturing of the Boeing Aircraft Company.

Q. One minute, Mr. Kice. May we go back? While you were working at the York Company and these other heating and cooling system supply companies, was your job the drawing of plans and construction of various heating and cooling systems?

A. Yes, sir, I designed heating and cooling sys-

(Testimony of Jack Kice.)

tems [328] and supervised their installation and operation, adjustment.

Q. That included gas furnaces?

A. Yes, sir, that included all types of heating equipment for residences, commercial, industrial application.

Q. Now will you continue?

A. When I went with the Boeing Company, after about two years of work in connection with tooling and plant layout, I was put in a supervisory capacity in connection with the building of the Boeing strato lab, a special facility for testing aircraft equipment under conditions simulating high altitude, in which we had to operate a strato chamber, and a chill room, and other large pieces of equipment, to give temperatures in the order of 65 to 75 degrees below zero, and sometimes even colder. Absolute pressures that would be comparable to altitudes of forty and fifty thousand feet.

I started in this capacity as foreman of the strato lab and eventually became a preliminary design engineer handling work involved in the heating and pressurization of Boeing aircraft.

During the period from about 1944 until the end of the war I also worked as a consultant to the Coleman Company on the design of their new line of heating equipment which they hoped—which they later went into production on after the war. [329]

When the war was over, I went with The Coleman Company as manager of the sales engineering department, which I organized and built up.

(Testimony of Jack Kice.)

Q. Sales engineering department, do you mean you co-ordinated what the sales department wanted with what the engineering department could manufacture or did?

A. Yes, it was a matter of determining what the requirements would be for products to meet market conditions, construction requirements, to comply with FHA and other authorities, and then advise the design department as to what was required, co-ordinate with them to see that it was designed properly, co-ordinate with the factory to see that that was handled. After we got the product into production or closely allied with that, we developed the installation instructions, we trained our own personnel, the personnel of our distributors and our dealers in the proper application engineering and installation of this equipment.

At that time the service department was separate from the sales engineering department.

The present reorganization, incidentally, is quite similar to—the application engineering department in the present organization is quite similar to the sales engineering department that I organized at that time.

I should have mentioned when I was with the Boeing Company one of the jobs that I did for them was to write a [330] chapter for their drafting room manual on the subject of the fluid flow, and it was a basic technical treatise which required a great deal of research at the time, and I feel helps

(Testimony of Jack Kice.)

me considerably in my present work, this particular research.

Q. Are you familiar with blueprints and other drawings?

A. Very much so. I taught blueprint reading at the Boeing Company in the early years that I was there. I, of course, supervised the tool designers who were working on drawings that became blueprints.

At one time I was in charge of about 40 tool designers in one section of the tool design department. At the present time there are about 40 people in my department, at least half of whom are engineers, and most of them graduate engineers, and their work is of a technical nature where we do all kinds of drafting and blueprint reading.

Q. Now, Mr. Kice, do you receive any complaints or statements from your salesmen as to your products and other things that happen or that would affect the company, are those brought to you?

A. That's right, they are.

Q. Now, have any of your salesmen or distributors ever come to you with any statements concerning this particular law suit?

A. Yes, we have had a number of complaints.

Q. And what do those refer to?

A. Well, they seemed to follow a pattern of complaints that they received from dealers, in which reference was made to the representatives of the Holly Company or their dealers advising customers that the wall heaters that we are making



(Testimony of Jack Kice.)

are subject to patent infringement suit, and that they are advised that they should not buy the Coleman heater because of this.

This situation seems to be most pronounced around the San Francisco-Oakland-Sacramento area, but we have had isolated cases in other spots too.

The only definite record that we have been able to obtain on this is shown in the copy of the Construction News that I noticed you showed Mr. Christie, although we have had oral reports quite often.

Q. Do you mean the document that I am holding in my hand, is that what you were referring to?

A. That's right.

Mr. Lyon: I will ask the clerk to mark that Defendant's next in order.

The Court: It may be so marked.

Mr. Christie: For identification, Mr. Lyon?

Mr. Lyon: I just want to ask that it be marked.

Mr. Christie: We object to its admission in evidence as going beyond the scope of pleading. [332]

Mr. Lyon: It hasn't been offered in evidence.

Mr. Christie: We further object to this line of testimony, because it seems to be beyond the scope of pleading and hasn't anything to do with the issues in this case.

The Clerk: Defendant's W, for identification.

(The exhibit referred to was marked Defendant's Exhibit W, for identification.)

The Court: What is the purpose of this?

Mr. Lyon: The purpose of this is to show that



(Testimony of Jack Kice.)

this case is brought before this court with unclean hands, and I do not believe that it is required to plead that fact. The actions of the plaintiff in this court, they have advertised, as the article that I have now submitted to your Honor shows, that they have three judgments against The Coleman Company on this patent.

The Court: Does this relate to matters subsequent to the filing of this complaint?

Mr. Lyon: Yes, sir.

The Court: Very well. The objection is overruled.

Q. (By Mr. Lyon): I will now hand the witness Exhibit W and ask him if he will indicate the material that he was referring to.

The Court: What is Defendant's Exhibit W, first?

Mr. Lyon: That is the document that he just referred to as being—well, will you identify what Exhibit W is, then, [333] again?

The Court: Is it a house organ?

Mr. Lyon: No. It is a newspaper.

The Witness: This is a construction newspaper published by the F. W. Dodge Corporation.

The Court: Who is the F. W. Dodge Corporation?

The Witness: The F. W. Dodge Corporation is the outstanding authority and publisher in the construction field. They publish Sweet's catalogues.

The Court: All construction?

The Witness: Yes.

(Testimony of Jack Kice.)

The Court: And this is a newspaper that they publish to the trade?

The Witness: That's right.

The Court: To the construction and building trade?

The Witness: That's right, your Honor.

The Court: And circulated where?

The Witness: This is the Denver edition, which is circulated all over the western part of the United States.

The name of the paper is the Daily Journal.

The Court: Defendant's Exhibit W, for identification, is what issue of that?

The Witness: This is the Saturday, February 13th issue. I believe it is a weekly paper.

The Court: Of what year? [334]

The Witness: Excuse me. 1954.

Did you want me to read this?

Mr. Lyon: Yes. It is a short article.

The Witness: The story which appears on page 1 in the center of the page is headed: "Holly Manufacturing Test Patents In Suit."

"Tom Gressett of the Thomas G. Gressett Company, manufacturer's representative for the Holly Manufacturing Company, has announced that the years long controversy over Holly's basic patents on its secondary heat exchanger and the claimed infringement by Coleman Manufacturing Company are currently being heard by the California Supreme Court.

"A judgment is expected in June. According to

(Testimony of Jack Kice.)

Gressett, Holly has won four previous suits contesting Coleman's heat economizer ideas, claiming they were developed from Holly's principals.

"The Holly Narrowwall gas heater utilizes the secondary heat exchanger, which was developed about eight years ago. Air warmed by the secondary heat exchanger is discharged from the upper grille and additional air is drawn from the floor level and circulated around the sides and up the back of the heater. This additional circulation of warm [335] air assures better warm air distribution and helps to maintain cool walls and warm floors.

"A favorable decision for Holly in the current case would probably mean that Coleman would be ordered to cease and desist manufacture of its product, Gressett said."

This is probably the source of the allegations that have been made by various Holly dealers and representatives in sales situations, in which Holly was competing against Coleman for business, some of which were large tract operations.

Our salesman from San Francisco called me about one of those situations about six or eight weeks ago, in which he claims that he lost a tract job involving several hundred units because of the concern of the customer over this allegation.

Mr. Christie: Your Honor, may we have this last answer stricken as hearsay?

The Court: It isn't offered to prove the truth of what was said, I take it; it is offered to prove what was said, isn't it?

(Testimony of Jack Kice.)

Mr. Lyon: That is right, your Honor.

The Court: For that limited purpose the evidence is received. The motion is denied.

Q. (By Mr. Lyon): Now, Mr. Kice, are there to your [336] knowledge any judgments or decisions that the Holly Company has again the Coleman Company with respect to these heaters in any way whatsoever?

A. None to my knowledge. This, I believe, is the first trial. [337]

Mr. Christie: We will stipulate, Mr. Lyon, that this is the only lawsuit between plaintiff and the defendant.

The Court: The first and only?

Mr. Christie: I believe that is correct, your Honor.

Mr. Lyon: I will accept the stipulation.

Q. (By Mr. Lyon): Now, Mr. Kice, was a retraction to this article made at any time by the defendant?

The Court: By the plaintiff?

Q. (By Mr. Lyon): By the plaintiff?

A. There was a retraction published in the same paper several weeks later.

Q. And whereabouts in that Journal did that retraction appear?

A. It was in a small paragraph sort of buried in the paper.

Q. Have you got a copy of that retraction?

A. I can find it there in my material.

Mr. Lyon: Might the witness be excused to get it?

(Testimony of Jack Kice.)

The Court: Yes.

Mr. Lyon: If your Honor please, I just learned of this retraction myself this afternoon, and that is why I have not had a chance to get it marked.

For the purpose of the record, the witness has just handed me a document, and I will have him identify it as soon as Mr. Christie see it. [338]

While they are examining that, I will offer Exhibit W in evidence.

The Court: The same objection?

Mr. Christie: Same objection, your Honor.

The Court: Overruled. It may be received in evidence.

(The document referred to was received in evidence and marked as Defendant's Exhibit W.)

[See Book of Exhibits.]

Mr. Lyon: Now, I ask that this document——

The Court: Is that another issue of the same newspaper? The same as Exhibit W?

Mr. Lyon: Yes.

The Court: Of what date?

Mr. Lyon: The title of it is Daily Journal, Denver, Wednesday, March 3, 1954. And I am offering it. Page 2 is the part that I am interested in. And I will ask that that be marked as Defendant's next in order.

The Court: It would be Defendant's Exhibit X for identification, Mr. Clerk?

The Clerk: Yes, your Honor.



(Testimony of Jack Kice.)

(The document referred to was marked as Defendant's Exhibit X for identification.)

The Court: Is it stipulated to be a genuine copy in all respects of what it purports to be?

Mr. Christie: Yes, subject to the same objection we made before, your Honor. [339]

The Court: Very well. Do you offer it in evidence?

Mr. Lyon: I will offer it in evidence.

Is this the document you referred to as the retraction?

The Witness: Yes, that is the document.

The Court: The objection is overruled. It may be received in evidence as Defendant's Exhibit X.

(The document referred to was received in evidence and marked as Defendant's Exhibit X.)

[See Book of Exhibits.]

Mr. Lyon: Now, your Honor, I would like to offer a book of patents to the prior art in evidence that I have had the clerk mark, and these are in the book in the same order as I provided the court originally.

The Court: Exhibits C to P, inclusive?

Mr. Lyon: C to P, inclusive.

The Court: Is there objection to the offer?

Mr. Christie: No objection, your Honor.

The Court: It may be received in evidence.

(The exhibits referred to were received in evidence and marked Defendant's Exhibits C to P.)

[See Book of Exhibits.]

(Testimony of Jack Kice.)

Mr. Lyon: I believe, for the purpose of the record, though, I had better give the numbers of the patents along with the exhibit number they have.

The Court: Very well.

Mr. Lyon: I had better do that for the transcript.

The Court: There is a list in the copy I have.

Mr. Lyon: I wonder if the court reporter could just copy the list. It is in here. There is an index of them in the book, the first page.

The Court: Is there any objection to the reporter copying that index into the record at this juncture?

Mr. Christie: No objection, your Honor.

The Court: It being an index of the contents of the prior art patent book containing Defendant's Exhibits C to P, both inclusive.

(The index referred to is in words and figures as follows:

Exhibit C—United States Patent No. 1,361,389, issued to McLeod December 7, 1920.

Exhibit D—United States Patent No. 1,698,775, issued to Traut January 15, 1929.

Exhibit E—United States Patent No. 2,453,954, issued to Wright November 16, 1948.

Exhibit F—United States Patent No. 2,484,457, issued to Marble October 11, 1949.

Exhibit G—United States Patent No. 2,487,775, issued to Cartter November 8, 1949.

Exhibit H—United States Patent No. 139,111, issued to Briggs May 20, 1873.

(Testimony of Jack Kice.)

Exhibit I—United States Patent No. 268,860 issued to Browell December 12, 1882.

Exhibit J—United States Patent No. 2,209,324, issued to Davison July 30, 1940.

Exhibit K—United States Patent No. 2,491,664, issued to James December 20, 1949. [341]

Exhibit L—United States Patent No. 303,174, issued to Mason August 5, 1884.

Exhibit M—United States Patent No. 2,093,492, issued to Snyder September 21, 1937.

Exhibit N—United States Patent No. 311,313, issued to Hamilton January 27, 1885.

Exhibit O—United States Patent No. 2,102,727, issued to Maher December 21, 1937.

Exhibit P—British Patent No. 140,989, issued to McLeod April 8, 1920.

Mr. Lyon: And for the court's information, these are the same as are identified as Exhibits C to P in the pretrial statement, too, and given the same number and order.

The Court: Yes.

Q. (By Mr. Lyon): Now, Mr. Kice, are you familiar with the defendant's structures Nos. 64, 67, 68 and 69? A. Yes, sir.

Q. What is the difference between these structures? \* \* \* \* \* [342]

Q. Mr. Kice, you heard the deposition, a portion of it that was read, of Mr. Coleman concerning a New Products Committee that was read into the record yesterday, did you not? A. Yes, I did.

(Testimony of Jack Kice.)

Q. Now, could you give us some of the members of that committee? I don't need them all, but——

A. Mr. Sheldon Coleman, Mr. W. C. Coleman, Mr. Clarence Coleman; the sales manager, Mr. Carl Burroughs; the purchasing director, Mr. John Schul; Mr. Dean Olds, the chief engineer at that time.

Q. Were you a member of that committee?

A. I was a member of the committee, yes, sir.

Q. In 1952?

A. Yes, sir. I have been a member for five years.

Q. Now, what actions did the New Products Committee of the Coleman Company take in relation to the development of the economizer that is in the case before this court?

A. Well, the New Products Committee doesn't design the product. They merely establish overall requirements and general specifications, that would include such things as, we need a line of wall heaters that would meet the market requirements. Generally, the market studies are made by others outside of the New Products Committee, and are passed and approved on, or if not approved, sent back for further study. As to design details, that is left up to the design people. [347]

Q. Now, have you searched the records of the New Products Committee of the Coleman Company?

A. Yes, I have.

Q. For the minutes of the meetings of this committee?

(Testimony of Jack Kice.)

A. Yes, we searched the records. As a matter of fact, at Holly's request.

Mr. Lyon: I will ask the clerk to mark the document entitled, Minutes of New Products Committee Meeting, August 14, 1952, as Defendant's next in order.

The Court: It may be so marked. It would be Y, would it not, Mr. Clerk?

The Clerk: Yes, your Honor.

(The exhibit referred to was marked Defendant's Exhibit Y, for identification.)

Q. (By Mr. Lyon): I will hand you Exhibit Y and ask you if you can identify that, Mr. Kice?

A. This is a ditto copy of New Products Committee record. The minutes for August 14, 1952.

Q. Now, does that refer to the steps in the development of the present Holly 67 heater?

A. Do you mean Holly?

Q. Pardon me. The Coleman 67.

A. Yes, this refers to the difficulties that were being encountered with the approval of the Model 67, 68, 69 and 64 Coleman heaters, and refers to a new design approach that we [348] had more hopes for getting approval.

Q. Were you present at that meeting, Mr. Kice?

A. No, I wasn't present at that meeting. However, I am fully informed of what went on at the meetings. It happened to be at a time when I was out of town. But I had been at other meetings before and after that one and am completely familiar with the situation.



(Testimony of Jack Kice.)

Mr. Lyon: I will offer this as Defendant's Exhibit Y in evidence. \* \* \* \* \*

The Court: Very well, the objection is overruled. Exhibit Y for identification is received in evidence.

(The document referred to, marked Defendant's Exhibit Y, for identification, was received in evidence.)

[See page 734.]

Q. (By Mr. Lyon): Now, Mr. Kice, will you explain the operation of the Coleman 67 heater with the four-foot economizer, [349] please? If you have any charts that would enable you to show this, will you produce those?

If you want one of these, you just tell me and I will bring it up to you.

A. I felt that the entire subject needed a little background for understanding of the design thinking that went into the development of the Coleman economizer, and probably throw some light on the basic differences between our design approach and the Holly design approach. As a matter of fact, it is a little difficult to make a comparison between the two devices, because there are so many fundamental differences in their operation.

Actually the similarity is only a surface thing. They both have wall heaters that are designed to go in a single stud space. But that is a thing that is common to practically everybody in the wall heater industry. And single stud spaced wall heaters will go back to before the war, covered by consid-

(Testimony of Jack Kice.)

erable trade literature, and all, that I could produce.

The fact that there is a flue stack in both of them is common with the entire industry; the fact that they both have gas burners is common to the entire industry; the fact that they both use ventilated flue stacks is common to the entire industry. Probably the only similarity that they have in common not shared by the rest of the industry is in the fact [350] that we both make our own ventilated flue stacks and have approval by A.G.A. as a unit to be sold with the heater itself. And on the surface, **that** is merely looking at them from the front, they appear to be similar because they both have grilles in the wall directly above the heater itself. But even the grilles are basically different in their function, and I would say that the Holly unit's design pedigree goes back to a fireplace ventilated flue that was allowed by the Patent Office in 1922, I believe it is—I will check that later—and the Coleman design pedigree goes back to a fireplace flue back in 1882. And by tracing the history from those two design pedigrees I believe it would be very obvious the differences that are involved in the design philosophy of the two units. [351]

Q. Mr. Kice, first before we go into that, could you give us a showing of the difference, or just exactly how the Coleman heater actually operates?

A. I would be glad to do it. I believe it would show up in the presentation I plan to make of these charts to show the Coleman furnace.

The Court: Do you wish an easel of some kind?

(Testimony of Jack Kice.)

Mr. Lyon: We will put these on this easel over here.

The Witness: Is that where you would rather do it?

The Court: Would you like to bring that out around near the lectern? Then everyone can see.

Mr. Lyon: All right.

Mr. Lyon: Now, we have a chart on the easel which states at the bottom, "Coleman No. 67 Single Wall Heater, Smooth Wall," and I ask that the clerk mark that as Defendant's exhibit next in order.

The Court: Exhibit Z for identification, Mr. Clerk?

The Clerk: Yes, sir.

(The exhibit referred to was marked Defendant's Exhibit Z for identification.)

Q. (By Mr. Lyon): Now, will you describe what is illustrated on Exhibit Z, please?

A. The chart here is drawn to scale and shows a Model 67 wall heater as manufactured by Coleman at the present time. It is identical to the units that are on display. [352]

Q. That is, Exhibit 24?

A. Exhibit 24, that is right.

We show here a wall heater that is comparable to most any wall heater that is made by other manufacturers in the fact that it has a gas burner and a radiator, with a draft diverter.

Q. Is the radiator in red?

A. The radiator is in red, and extends up—the

(Testimony of Jack Kice.)

top portion here is the draft diverter, which is a part of the heater itself. And it is enclosed in a metal cabinet. The cabinet as designed would be put in a recess cut into the wall between two studs. The studs are commonly 16 inches apart on center, so that the width between them is approximately  $14\frac{1}{4}$  inches, or so; and in common with everyone in the industry, we all make it easy for the installer by making the wall heater slightly under that dimension in width.

Mr. Lyon: One question: When you say common to the industry here—you have used that term—how long ago was this common? I mean, is that something recent or something old?

The Witness: I would like to show my historical development to bring that out better. I have some charts that I believe will show that better than this. But the wall heater designed to fit in a single stud space first appeared on the market some time shortly after the war in our part of the [353] country. Now, they may have been available out here in very limited quantities—certainly hadn't made a mark on the industry—as early as 1941, 1942. But we didn't see that type of wall heater in common use nationally until somewhere around 1946.

It might bear mentioning that we became quite interested in the wall heater as a new product for the Coleman Company in early 1947 and had our—had discussions in our New Products Committee that led to the concept of a circulating type of wall

(Testimony of Jack Kice.)

heater that would fit in a single stud space pretty well defined by the end of 1947, after making market studies of all of the types of mild climate heating devices that might be—fit in the same market that our floor furnaces were sold in.

The Coleman Company has been a leading producer of floor furnaces since 1936 or '37, and mild climate heating is a specialty of ours. Now, that is the reason why we made the study of the wall heaters that led to this general type of design. And I would say that, very largely, the fact that this type of design has become popular is because the Coleman Company adopted it and promoted it; that is, the unit that would conveniently sit, locate in a single stud space and was so easy to install.

I have pointed out that the unit goes into a recess in the wall. And the casing around it is a ventilated casing, to [354] keep the structure cool, to prevent excessive temperatures in the wall. The outer shell, the part that you see, is decorative so that it makes a nice, neat appearance. And the circulating type wall heaters have the casing closed except for a grille at the top and bottom, for circulation. Those two grilles, again, are common with the rest of the industry. There are some exceptions. One particular company makes it wide open and merely radiates the heat. But we have been an advocate of good circulation as important as a comfort, and so we work very hard to get the maximum amount of circulation in our units.

Now, this part up here is the part that is not



(Testimony of Jack Kice.)

common to the rest of the industry. In fact, the Coleman Company is the only manufacturer who provides this inlet grille at the mid-point. I would call that an intermediate height inlet grille; which is in there to ventilate the ventilated flue passage.

The Court: Is that marked in any way on Defendant's Exhibit Z for identification?

The Witness: I refer to that as the "second stage inlet grille, independent air source, 'built in' top of cabinet extension," on which we have applied for patent. [355]

Mr. Lyon: Mr. Kice, would you point that out on Exhibit 24-A, that particular grille, to the court?

The Witness: As you can see, it is a substantial size grille in the top ledge of the cabinet shell.

Another pair of grilles that I would like to call your attention to at this time, which is not common to the rest of the industry, nor to Holly—incidentally, this is not provided in the Holly unit either, the grille that I just described is not provided in the Holly unit, nor are these grilles here provided in the Holly unit (indicating). These are outlet grilles that ventilate the lower section of the unit and the stud space surrounding it.

Mr. Lyon: Those are marked grilles 9 and 10 of Exhibit 24-A, that you just referred to?

The Witness: That's right, sir.

The Court: Isn't the grille in front an outlet grille?

The Witness: We might just go through all of the grilles here.

(Testimony of Jack Kice.)

Mr. Lyon: What is the main grille there, the great big one with the tag hanging on it, for, Mr. Kice?

The Witness: The large grille at the top of the cabinet is provided for the outlet of the heated circulating air. It also provides a relief for the draft hood. In other words, the relief opening of the draft hood opens out through a portion of the outlet grille. [356]

This large grille at the bottom here is the return recirculating grille, and it is supplemented by another opening——

The Court: The grille at the bottom is sort of the intake grille, isn't it?

The Witness: That is right. It is the intake for the recirculating air.

There is also an opening in the bottom, which supplements the intake grille.

The Court: That isn't covered with louvres?

The Witness: That's right, simply because it doesn't need it from an appearance standpoint, and we are able to get more effective opening by not having the louvres.

In addition to the recirculating air for the heater we also have air for combustion through this opening.

The Court: That is the opening——

The Witness: The air that is required—I see. The opening in the base of the cabinet shell. And that is combustion air required by the burner.

Air also comes through the bottom opening to

(Testimony of Jack Kice.)

provide ventilation to keep the cabinet cool and to keep the stud space cool surrounding it. And it enters through these lower openings that I have just described and comes out through the side openings that we have provided in the top side of the shell. [357]

The Court: The air which is emitted at points 9 and 10, those side grilles at the top on either side of Exhibit 24-A, are they separated somehow from the air that is emitted through the main front grille there at the top?

The Witness: Those openings are completely separated by these plates that are built into the unit. And the top of the heater fills in the rest of the space here. The closure is as snug as convenient. We don't hermetically seal that space, but it is made comparatively tight.

The Court: Then the outlets 9 and 10 let air out from the sides of the lower box?

The Witness: That is exactly right, sir, that is the way that we keep the temperatures from building up in the lower section of the casing.

The Court: The main grille in front lets air out from the front of the lower box?

The Witness: That's right, right up through there.

The Court: How does the air get out from behind the box?

The Witness: The air from behind the box or the space in back of the box communicates with the column spaces in the side of the cabinet from top

(Testimony of Jack Kice.)

to bottom. So that any air that could be in that space is free to come up through the relatively large spaces running from top to bottom, and this is the most convenient point for it to come out (indicating). [358]

The Court: Grilles 9 and 10 of Exhibit 24-A?

The Witness: That's right.

The Court: Is there any means devised for that air to go upward into the economizer?

The Witness: The only air that would get up there is leakage air, which I believe will show up better in my charts as I go ahead with it.

Q. (By Mr. Lyon): Mr. Kice, doesn't a great deal of that air that comes up the back—isn't that also vented out through the attic?

A. There is a channel shown here in this drawing——

The Court: Exhibit Z.

A. (Continuing): ——which points out that air is intended to go up the back of the unit completely up the area shown in back of the ventilated flue passage.

Q. (By Mr. Lyon): That is outside of the shell of your economizer?

A. Outside of the economizer, yes, sir.

The Court: Do you mean outside of the outer shell?

The Witness: Yes, sir, outside of the outer shell of the economizer.

We are not dependent on that, because we anticipate that in some cases—if you would strike that,

(Testimony of Jack Kice.)

please—in many cases the wall will be plastered, and plaster keys can restrict and even stop up the passage of air in back of the [359] heater. So we felt that it was important in the design of this unit that our unit—that our economizer could be properly vented, whether there was any air flow from below or not. In other words, completely independent of the flow of air up the stud space. It has its own built-in economizer.

I would like to get back to tracing this thing from its origin.

Mr. Lyon: If the witness can tell his story better that way, I would agree to have him tell it that way.

Go ahead, Mr. Kice.

The Witness: I have, I believe, a line of thinking here that would clarify some of the confusion that is evident, and I believe we would be able to see the forest instead of having so many trees in our way.

I would like to bring out the fact that the Holly unit uses what has been called in the trade for many years—in fact, more years than any of us here are old—a ventilated flue stack. They call it a secondary heat exchanger. And I believe they are utilizing it primarily for its heat exchange purpose. We use a ventilated flue stack purely as a ventilated flue stack.

Our design problem is to keep the stack cool so that it does not overheat the wall.



(Testimony of Jack Kice.)

As such it goes way back in the patent art to the 1880s, and even earlier. [360]

Mr. Lyon: Now you are putting up a chart, which I will ask the clerk to mark as Exhibit AA.

The Court: It will be so marked.

(The chart referred to was marked Defendant's Exhibit AA, for identification.)

Mr. Christie: Your Honor, we have never seen these charts and we know nothing about them.

Mr. Lyon: They were shown to you this morning.

The Court: Can't you look at them, Mr. Christie, as they are put up?

Mr. Lyon: These are purely illustrative of the witness' testimony, your Honor.

The Court: Let's mark them as rapidly as possible.

Mr. Lyon: We will use them in this order, so start on AA.

The Court: Have you seen Exhibit AA, Mr. Christie?

Mr. Christie: I haven't, but I understand that Mr. Hoegh has seen them this morning for the first time.

The Court: Very well.

The Witness: I made these up over the week-end because it became apparent in the testimony last week that some enlightenment would help everybody to get an understanding, and perhaps for us to be talking the same language, too.

I think that a lot of the misunderstanding be-

(Testimony of Jack Kice.)

tween Holly and Coleman may be simply due to not understanding the same [361] meanings by the words that are being used.

The first wall heater was obviously a fireplace, and we normally think of a fireplace as being a wood-burning type in which you see the flame, but it is not necessarily so, because many, many fireplaces have enclosures like this (indicating), and many——

The Court: By “this” you mean as shown on Exhibit AA for identification?

Mr. Lyon: Yes.

The Witness: The little doors that I folded over, is what I refer to.

As a wall heater it is obvious that it is located in the wall and reaches from floor to ceiling. It has a so-called first box, which is the major portion of the fireplace; and it has a second box, if we want to consider the flue the second box, as has been done in the patent in suit.

The comparison there is probably more clear when I show the side view. [362]

The Court: Are you now referring to Exhibit——

Mr. Lyon: BB. What is the next one?

The Clerk: AB.

Mr. Lyon: Exhibit AB.

The Witness: This exhibit AB shows a side view of the typical fireplace which I referred to as the first, the original wall heater. What we call the first box would contain the first radiator, in terms of the patent in suit, because there is radiation which takes

(Testimony of Jack Kice.)

place from the flame front, or from the closed doors. Let's call this the first radiator. (Indicating.)

The second radiator is the radiation that would take place from the upper portion of the flue; and a lot of the heating from the fireplace is the result of that radiation.

Our burner could be wood, log or coal, or a gas burner. There are millions of fireplaces that operate with gas burners.

I call your attention to the fact that a typical fireplace has a large cross-section in the first radiator. It has a substantially smaller cross-section in the upper radiator. And it has a draft hood with a deflector or baffle built into it, in any good fireplace. This is more commonly called a smoke shelf when you build a fireplace, but it is a deflector, and would deflect any down draft out through the hood.

Now, we have only been talking about fireplaces which are commonly thought of as made out of brick or stone. But [363] back in 1882 Mr. Brownell—the patent, we don't have the number.

Mr. Lyon: Exhibit I.

The Witness: Exhibit I. —showed a ventilated flue stack, as I have illustrated here in green on the overlay, which was made out of metal; has an inlet opening at the intermediate height above the first box. And the air that is used to ventilate the flue and keep it cool is then discharged into the room and utilized for the sake of economy. That is the first economizer as it is used in the Coleman design.

(Testimony of Jack Kice.)

Q. (By Mr. Lyon): Mr. Kice, you have depicted substantially the device as described in the Browell patent, Exhibit I, in this overlay to Exhibit AA?

A. That is right. This illustrates very close—I don't believe there are any significant differences between what I have shown here on my overlay and the illustrations in the Browell patent. In fact, there is a sketch there that I copied this from; that is, a part of the drawing is what I copied this from.

You will note that air enters the economizer——

Q. Would you mark that with a red pencil, A?

A. I have one—air enters the economizer at points A, in openings directly above the lower box, and would absorb heat from the flue and would exhaust back into the room [364] through an outlet, which I will mark B.

In the Browell patent it shows the optional alternative of going on up into second floor rooms. But what we have shown here is the practical application of the Browell patent.

Now, if I may refer back to Exhibit AB, the overlay,——

The Court: AB?

The Witness: Yes, sir.

The Court: Your last exhibit you were dealing with was——

Mr. Lyon: AA.

The Court: The Browell patent.

The Witness: The Browell patent was the overlay on Exhibit AA.

(Testimony of Jack Kice.)

The Court: And it is marked——

Mr. Lyon: The first one was AA that he was just discussing. Now he is discussing AB.

The Court: You mean the drawing which illustrates the Browell patent is made a part of AA?

Mr. Lyon: It was the overlay added to AA, if your Honor please.

Mr. Christie: Your Honor, it looks to me as though it is Mr. Kice's interpretation of the portion of the Browell patent; it isn't the Browell patent.

The Court: Of course, it is his interpretation.

Mr. Lyon: Your Honor, see, this is Exhibit AA originally (indicating). I mean, it was marked with all of this on. [365] Now, when he says that he adds the Browell patent, Exhibit AA, he does it by means of this overlay on top of it.

The Court: Another drawing which is attached to and is a part of Exhibit AA for identification?

Mr. Lyon: That is right, your Honor. Now, he is doing the same thing on AB, which is the side view of AA.

The Witness: You will recall that AB is a side sectional view of a typical fireplace. And we find in the art that Mr. McLeod has a patent which was allowed in 1919.

The Court: Exhibit——

Mr. Lyon: Is that Exhibit C, Mr. Kice, that you are referring to?

The Witness: That is Exhibit C, which is a metal ventilated flue stack and fireplace enclosure,



(Testimony of Jack Kice.)

that is very similar to the Holly design philosophy.

In fact, I see in this every element that is claimed by Holly. Remember that we had the lower box and the upper box, with a first radiator and a second radiator and a draft hood, with what we call a deflector.

Now, the ventilation passages that was the invention of Mr McLeod provides ventilation from grilles at the floor level that permits a flow of air around the sides and the back of the lower radiator, or lower box, excuse me, and permits it to flow up into the second box and through it, picking up the heat from the flue, keeping it cool thereby, and [366] the heat that it picks up is discharged through a grille near the ceiling into the room.

Q. (By Mr. Lyon): Now, is that around the bottom—in this last device is there a shield between the chamber where the fire is and that——

A. Yes, there is a metal shield right up the—surrounding the entire first radiator.

The Court: Now, does the air from the back of the fireplace there get over to be ejected out the front grille above?

The Witness: The space that I have shown here in blue is actually an annulus surrounding the flue passage which is made out of metal and would join on a flue going on up to exhaust the fumes outside. So it seems to me that in these comparatively early inventions we can see the elementary differences between the Coleman design, which is quite similar to the old Browell patent in 1882, and the Holly

(Testimony of Jack Kice.)

unit, which is quite similar to the McLeod patent that dates back to 1919.

The fact that they are fundamentally different is pretty well proven by the fact that the Patent Office allowed separate patents on the two basic ideas. They are both ventilated flue stacks, but they operate in a different manner.

Now, I'd like to carry from that then into the more recent developments of heating devices which have taken the name of wall heaters in the trade.

Mr. Lyon: Just a minute. I will offer these two as [367] illustrative of the witness' testimony, as Exhibits AA and AB in evidence.

Mr. Christie: No objection, if so limited, your Honor.

The Court: They may be received in evidence.

(The exhibits referred to were received in evidence and marked as Defendant's Exhibits AA and AB.)

The Court: Are you offering Z?

Mr. Lyon: Yes, I will offer Z in evidence, too, as Defendant's Exhibit Z on the same basis, illustrative of the witness' testimony.

The Court: Is there any objection?

Mr. Christie: No objection, on that basis, your Honor.

The Court: Exhibit Z for identification is received in evidence.

(The exhibit referred to was received in evidence and marked as Defendant's Exhibit Z.)

The Witness: Now, this sketch is intended to—

(Testimony of Jack Kice.)

Q. (By Mr. Lyon): What is this marked, Mr. Kice?

A. This is Exhibit AC. And it is intended to just illustrate, for purposes of our discussion here, a typical early heating device which we first called a wall heater.

I believe that those were in use, to a limited degree, in California, as early as 1935; perhaps earlier. I first saw a unit of this type in Wichita in 1941, which had been installed in 1939. [368]

Essentially, it was a fireplace made out of metal; somewhat the same arrangement as the units that we have been looking at. Perhaps it might also be described as a stove designed to set into a wall recess. It consisted of a lower combustion chamber or radiator in which a gas burner was designed, with a draft hood; all of which would be combined in a lower box and covered by a decorative shell or enclosure, which would have an inlet grille and an outlet grille through which the air to be heated would go in and come back into the room. The draft hood, of course, was provided because all gas fire heating equipment must have a draft hood. The vent went up through the wall, through the stud space in the wall and discharged out of the house.

The Court: By "the vent" you refer to the flue?

The Witness: The flue. Thank you.

Now, the studs—I have indicated here by dotted lines the studs, and I believe it will show the main problem here with this type of wall heater. You see

(Testimony of Jack Kice.)

here is a stud, here is a stud, a stud and a stud—and I will label them. [369]

The Court: With the heater extended over more than one stud space, is that it?

The Witness: That's right. It made a difficult installation and required cutting of the studs to install it, and then extra framing by the carpenter, which was rather expensive.

Now, to overcome that——

Mr. Lyon: I will offer Exhibit AC as illustrative of the witness' testimony.

Mr. Christie: No objection.

The Court: Received in evidence.

The Witness: To overcome that installation problem a unit was designed to fit in the single stud space, a vertical design, rather than a horizontal design as I have just shown.

Q. (By Mr. Lyon): You are now referring to Exhibit AD?

A. This is Exhibit AD.

It has the advantage of fitting into the single stud space and is very easy to install. It illustrates the typical wall heater in many respects. It has a draft hood and a relief opening, and the main difference between this and the heaters that we are showing here is in the fact that these early ones were designed with an open front and heated the room primarily by radiation, rather than convection air currents that would circulate throughout the room. So I will label that as an open-front unit radiant. [370]

Q. Could you give us the names of some of the

(Testimony of Jack Kice.)

heaters that were built of that type that you know of?

A. By far the outstanding type unit, make of unit of this type, is the Day-and-Night Panelray unit.

The Court: Is that electric or gas?

The Witness: It was gas, sir, and has a burner in the base with these—this is the combustion chamber or radiator, in the language of the patents in suit. Its disadvantage, of course, was poor circulation. So we have here in the art up to this time, which would be 1945, the horizontal type of unit that had fair circulation, but was difficult to install, as shown in Exhibit AC. The other type of wall heater was easier to install, but had poor circulation.

The Court: By poor circulation you mean the hot air did not circulate into the room?

The Witness: That is what I mean, sir.

This brings us, then, up to the period after the war.

Mr. Lyon: I will offer Exhibit AD as illustrative of the witness' testimony, in evidence.

Mr. Christie: No objection.

The Court: Received in evidence.

(The exhibit referred to was marked Defendant's Exhibit AD, and was received in evidence.)

Q. (By Mr. Lyon): Now, what exhibit do you have before us? [371]

A. This is Exhibit AE. This brings up the pe-



(Testimony of Jack Kice.)

riod after the war, and the Coleman Company became interested in the market for equipment that might be competitive to floor furnaces, recognizing that there are some disadvantages in installing floor furnaces, and the service problem under the floor, and that sort of thing, which were greatly reduced in the wall heater type of heating device. And we studied the types of equipment that were on the market. The two that I have shown you are only two of a large number of devices that were considered.

We decided at that time that a unit which would combine the advantages of the two types I have just shown would have the best possibility for success in the market. So we developed our thinking along that line, and late in 1947 I was responsible for specifications of a wall heater that would set in a stud space, a single stud space, and would have good circulating characteristics, would be enclosed to prevent anyone from getting burned on the hot radiator.

I thought at the time that it was a brand new idea. I found out later that there have been units of this general type that were in production in a very small way, even before I had the idea myself. But it was not a particularly new thing, and there were no patents on the idea of a single stud space, and enclosed, as this is.

It was so popular that most everybody began making wall heaters with this general configuration.

(Testimony of Jack Kice.)

Let me point out the most important factors in this design, as related to the patent discussion. We have the burner in a combustion chamber or radiator, and a draft hood with a relief opening, closed in front, with circulating grilles through which air could be heated, passes over hot radiators and is discharged out into the room. The unit goes in a wall between the ceiling and the floor.

It was easy to fit in one stud space, and does not require cutting the studs. It is easy to install, and it has good circulation.

This is the type of unit that we first conceived in 1947 and produced in 1949. It went under the Coleman model numbers 60, 61, and 62. The model that I have shown here would be similar to the model 60. The model 61 is a unit that was also similar, but had a rear outlet. And the model 62 is what was referred to in the trade as a dual-wall wall heater, in which the inlet and outlet grilles open into two adjacent rooms, and you might think of it as two wall heaters back to back inside the wall space. There is no stud space to the rear of such a unit, obviously.

Q. (By Mr. Lyon): Mr. Kice, what was the relation in that heater—did it have a flue in that heater?

A. By all means. Thank you. The flue was provided and would go from the top of the draft hood up through the [373] stud space, and would exhaust the products of combustion outside.

(Testimony of Jack Kice.)

The Court: On that drawing, as I see it from here, the heater is wider than the stud space.

The Witness: The part that goes in the stud space is just slightly narrower than the stud space. The shell is outside.

The Court: I have it now. It is the shell that appears wider.

The Witness: O. K. Fine.

Q. (By Mr. Lyon): Mr. Kice, what was the relation between the flue and the radiator in this device?

A. I believe it shows in this cross-sectional view in this next exhibit, quite well.

The Court: Which is Exhibit AF for identification, is it?

The Witness: The next exhibit is AF.

This is a sketch of the same Model 60 Coleman wall heater, and you can see that the radiator, the lower radiator is installed in the recess of the wall. The upper radiator runs between the stud spaces. The cross-sectional area of the lower radiator is substantially larger than the upper radiator.

Perhaps that is shown better on the sketch AE.

Incidentally, we found no significant difference, no [374] significant importance to the size of the upper radiator—

The Court: The upper radiator is really just a flue?

The Witness: That's right. The flue size is in compliance with the requirements of the American Gas Association.

(Testimony of Jack Kice.)

We used at this time a flue size that would fit the four-inch oval Metalbestos or four-inch Transite, which was common use at the time. We still use the same size flue passage in our wall heaters, whether we provide it with the economizer or—our smaller units do not use the economizer, as you will see a little later.

The Court: The flue is a different shape, though?

The Witness: The flue passage is exactly the same shape and the same size in the economizer models and in the models without the economizers.

I might point out, too, that the size of this flue is principally established in the interest of standardization. We use the same flue size and shape for all models from 25,000 B.T.U.'s up to 55,000 B.T.U. sizes.

And incidentally, the Holly Company does too.

And all this reference in the patent to critical velocities and laminar flow, and all that, is so much poppycock, in my opinion, designed merely to influence the patent examiner.

Q. (By Mr. Lyon): Mr. Kice, I will hand you Exhibit AI and ask you if that describes the Coleman Model 60 that you [375] have been referring to in Exhibits AE and AF.

A. That's right, Exhibit AI is one of our specification sheets that gave the information to the trade on all dimensions, capacities, and so forth, for the Model 60.

Q. Those were published as early as 1949?

A. Yes, sir.

(Testimony of Jack Kice.)

Mr. Lyon: I will offer that in evidence as Exhibit AI.

The Witness: This is one that was published in 1949.

Mr. Christie: No objection as long as it is limited as illustrative only of the witness' testimony.

Mr. Lyon: I will not limit the offer here, because it is proof of the publication and use of that in 1949.

Mr. Christie: Then we object, your Honor, to the introduction on the ground that it is not proof of 1949. The only word that we have on it, I believe, is Mr. Lyon's testimony to the effect that it was introduced in 1949.

Mr. Lyon: I believe if the record is read, the answer was made by the witness that it was published in 1949.

The Court: When was Exhibit AI published, Mr. Kice?

The Witness: S-572 form number is a 1949 date.

The Court: Your answer is that Exhibit AI, for identification, was published in 1949?

The Witness: That is what I intended to say, yes, sir.

The Court: The objection is overruled and it is received in evidence. [376]

(The document referred to was marked Defendant's Exhibit AI, and was received in evidence.)

The Court: Do you offer AE and AF, for identification?



(Testimony of Jack Kice.)

Mr. Lyon: I don't know whether he is through. I was going to wait until he finishes his testimony, because they are illustrative, your Honor, and then I will offer them.

The Court: Are you finished with those charts, AE and AF?

The Witness: No, I am not through with them yet.

Here, again, just to make matters clear, is the lower box.

Q. (By Mr. Lyon): You are referring to AF?

A. In Exhibit AF, lower box, and the upper box or flue, as we prefer to call it, since it is nothing more than a flue. Exhibit AE, I would like to show you a problem that has been common to all wall heaters. The fact that this area directly above the wall heater in the wall——

The Court: Which you have marked with a red "X"?

The Witness: Which I have marked with a red "X", —would get warm, sometimes even hot. The problem was due to the fact that the vent stack here would get rather warm, it would get hot enough that it could even blister paint, and has been a problem that all manufacturers have encountered from the time wall heaters were first brought out. Because of that problem many installers would line the stud space with [377] a metal liner.

Mr. Lyon: You are now drawing on AF?

The Witness: Particularly in that section of the stud space surrounding the flue.

(Testimony of Jack Kice.)

I have shown that liner in purple on the sketch on Exhibit AF.

That was a fairly common practice. Particularly we used a material which is known in the trade as Transite, which is a pressed Portland cement and asbestos composition material, quite satisfactory in most respects except that it does transmit heat rather rapidly, and the high degree of transmission of heat was responsible for the temperature increase.

The idea of lining the stud space led, I think, to the development of the double wall flue pipe known as Metalbestos, and Amerivent and Payne-A-Vent, three different types of double wall ventilating flue material that are or have been on the market.

Q. (By Mr. Lyon): Just a minute, Mr. Kice. When you refer to Metalbestos, and so forth, are you referring to an item such as that described in Exhibit T?

A. Exhibit T is a piece of literature that describes the Metalbestos; typical of the more recent developments of this company in the double-wall pipe.

The earliest Metalbestos pipe and Payne-A-Vent were almost exactly what we would have here if this were a metal stack [378] with a metal enclosure around it. And the improvement that is shown there is simply a type of end-forming piece that makes it easier to join the pipe together than attempting to join two annular pipes together.

(Testimony of Jack Kice.)

The Court: The Metalbestos leaflet, Exhibit T, does the record show when that was published?

Mr. Lyon: Yes. Mr. Hollingsworth admitted that that was in existence previous to anything that he had invented. I don't remember that the record says just what date it was, your Honor.

The Witness: The literature has a date, your Honor, 1949, on it. And Metalbestos was producing an earlier design of similar material as early as 1946, I am sure. Perhaps earlier than that.

This sheetmetal enclosure——

The Court: Referring, again, to Exhibit——

The Witness: As shown in Exhibit AF, was one way of helping to prevent excessive wall temperature, but depended on an opening in the plate above the stud space to permit the air to enter here, go up around the back and sides of the lower box, entering the annular space around the flue, and then discharge up into the attic. That was the flow of air that would ventilate the stud space and keep the walls cool.

Now, there were many codes, city codes, that would not permit the open stud space; required what they referred to as [379] a fire block here, (indicating), which might be cement, or some other fire-safe material, asbestos composition. Of course, then, that would prevent the ventilation that would keep the wall cool. So where those codes were in effect, our answer to it was to cut an opening in the wall, which we would provide with a grille like so (indicating).

(Testimony of Jack Kice.)

Now, that basic idea is old, too. My dad showed it to me when I was working as a helper in a tin-shop back in 1938 or '39. No. 1931 or '32, sometime in there. And it was old to him. It is shown in these early patents which I have mentioned, in Exhibit AA and AB. [380]

Now, I don't know for sure whether this was the origin of the idea back of the patent in suit or not. But it is my guess that it would have led to it.

Mr. Christie: May we have that answer stricken as speculative, your Honor?

The Court: Yes.

The Witness: I said it was speculative.

The Court: A great part of the witness' testimony as an expert are conclusions and speculations.

The upper grille, you say, is the answer to the problem of cutting off that ventilation up into the attic?

The Witness: That is correct.

The Court: When was that answer first found?

The Witness: I would guess that it must have been in the 1880's; would be when they first provided flues with grilles.

The Court: When you go back to that date, why, I don't suppose you were concerned with any building ordinances.

The Witness: No, simply a matter of conserving the heat. They referred to that as an economizer at that time.

The Court: But you say the answer to the build-

(Testimony of Jack Kice.)

ing ordinance of cutting off that ventilation into the attic was that upper grille.

The Witness: That is right.

The Court: My point is to what time did you refer when [381] you say that answer was given?

The Witness: I can't tell you.

The Court: As I understand it, you were speaking of the modern art.

The Witness: Yes.

The Court: The current art.

The Witness: I knew about it before the war as an answer to the building code problem when we used the Metalbestos in connection with our floor furnace vents.

Mr. Lyon: Isn't that development shown in Exhibit T, Mr. Kice?

The Witness: Yes, Exhibit T, which is the Metalbestos literature to which I referred. It shows a very clear diagram of the principle that I am showing in more detail here on my Exhibit AF.

The Court: Very well. I just wanted the record to show.

The Witness: Yes, sir. It is dated 1949. It was an old thing at that time; no claim at all for it being new.

I perhaps should refer to the Plaintiff's witness' testimony in regard to this as a matter——

No? Excuse me. If I shouldn't do that——

The Court: You will be arguing the case pretty soon, Mr. Kice.

The Witness: All right.



(Testimony of Jack Kice.)

The Court: You just testify and leave the argument to [382] the lawyers.

The Witness: Thank you. The illustration here is the top view of what—the illustration in the literature is an upper view of the box that I have shown in Sketch AF.

The Court: The “literature” being Exhibit T?

The Witness: Exhibit T. The literature is noted as T. My sketch is AF. And it shows a grille ventilating the stud space, and it brings out the fact that says, “If local building codes prohibit a top opening, install ventilating louvres as shown in the illustration.”

The Court: You have just now read from Exhibit T?

The Witness: I have read that from a paragraph in Exhibit T. And I will mark the sentence that I am quoting with a purple crayon on Exhibit T.

The Court: All right. Have you finished with AE and AF, now, those charts?

The Witness: I would like to put the ventilation pattern of air flow on Exhibit AF in blue crayon. Air would enter at the floor level, would rise up around the back and sides of the lower box, then enter the annulus between the metal liner surrounding the flue, picking up the heat from that and ventilating into the room.

And as far as I can see, that is completely the basic idea in the so-called secondary heat exchanger of the Holly patent. I see no differences in any of its functions. [383]

(Testimony of Jack Kice.)

And now, that takes us, I believe, to about 19——

Mr. Lyon: Are you through with these two exhibits now?

The Witness: Yes.

Mr. Lyon: I offer Exhibits AE and AF in evidence as representing, illustrating the witness' testimony.

Mr. Christie: No objection.

The Court: They may be received in evidence.

(The exhibits referred to were received in evidence and marked Defendant's Exhibits AE and AF.)

The Witness: That takes us then to about 1949, when we became interested in improving our line of wall heaters. Originally, we had developed them for minimum tooling expense, more or less to try the market out, and so we wanted to make all the improvements that we possibly could at the time.

There has been quite an issue raised over whether the Coleman Company saw the Holly unit before we made our own design. There is no mystery about it. Sure we saw it. We saw a dozen other wall heaters at the time, too; and studied them all over. I believe that is common practice.

Incidentally, when I was at the Holly Company taking the depositions, in their laboratory I saw half a dozen—perhaps not that many, but three or four competitive furnaces that they were looking at in the development of a new line of new forced air furnaces that they recently announced. So it is

(Testimony of Jack Kice.)

common industry practice to look at your competitors' [384] products.

The Court: That is common practice in most industries.

The Witness: Yes. We studied the Holly unit. And at that time you will recall there was no patents that had been issued, and we did not believe that there could be a patent on the device, on their design, at the advice of our counsel. Not Mr. Lyon, but our regular counsel in Chicago. This opinion was based on a study of the prior patents, and also on a study of what was common trade practice at the time. And the illustrations that I have just given you are the factors that were involved in our thinking which made us believe that there was no possibility of a patent.

Now, we did have a design, that was quite similar to the Holly device, that we experimented with. But we did not produce it because, frankly, we couldn't make it work. It would not——

Mr. Lyon: Is that shown in any of the exhibits we have put in, Mr. Kice?

The Witness: We referred to that in the New Products Committee minutes that were just handed in evidence this morning.

The Court: Exhibit Y?

Mr. Lyon: I will check, your Honor. Exhibit Y, yes.

The Witness: Exhibit Y indicates that we had been unsuccessful in the experiments with the device that was similar to Holly in that it brought air into

(Testimony of Jack Kice.)

a space around the lower box at the floor, and simply allowed that air to feed up to the—through the stud space to the ventilated flue stack, and then directly into the room.

In fact, we had the cooperation of the American Gas Association at Cleveland in an attempt to make that work in that their testing of it was not successful in our adaptation of that old scheme. So we would like to——

Q. (By Mr. Lyon): Mr. Kice, you failed to pass the AGA test with that type of heater?

A. That is right. And after we found that it was not successful, we were—we decided that there were some fundamental faults with that type of thing, anyhow, and we did not carry on, for a long period of time, attempting to make that one operate, but went to a design that would not be dependent on maintaining an unrestricted flow or unrestricted channel in the stud spaces.

I think that line of thinking is best illustrated by these charts (indicating).

Mr. Lyon: The witness has designated a chart which I will ask the clerk to mark——

The Clerk: Exhibit AJ.

Mr. Lyon: ——Exhibit AJ.

(The chart referred to was marked Defendant's Exhibit AJ for identification.) [386]

The Witness: Exhibit AJ is a scale—excuse me. It is not necessarily a scale drawing—carefully drawn exhibit, taken from the Holly patent, not from the actual project. Incidentally, there are a

(Testimony of Jack Kice.)

number of differences between the actual production and the patent drawing; most important of which is that there is a bottleneck, or a neck in the radiator before it joins the draft diverter, which is not shown or implied in their patent. This does not show the bottleneck. This I believe does illustrate the air flow that is depended on for ventilation of the lower box and the upper box, in green. The burner and lower radiator, which is the primary heat exchanger, and the draft diverter, are shown in red. The flue products, the products of combustion going up through the flue is shown in orange.

If you will recall the exhibit that I just showed, Exhibit AF, it has identical air passages for ventilation to this shown in the patent.

Q. (By Mr. Lyon): What color are those air passages shown in in this drawing, Exhibit AJ?

A. The ventilation air passage is one stage of ventilation shown in green entering at the floor level, going upward around the lower box and entering their so-called secondary heat exchanger and discharging into the room.

Q. That is shown in Exhibit AJ?

A. Quoting from the patent, it says, "Air flowing upward [387] outside the first box and inside the wall." And then, "Not that this is the only source of air for the second box." There is no other source of air for it.

Now, I would like to refer to the next exhibit——

Mr. Lyon: I will have the clerk mark it.

The Clerk: Exhibit AK.



(Testimony of Jack Kice.)

Mr. Lyon: AK for identification.

(The exhibit referred to was marked Defendant's Exhibit AK for identification.)

The Witness: I think it would be very obvious why we decided that we did not want to do it like Holly, even though we did not think they could obtain a patent at that time.

A large share—I will not say the majority, but certainly a large share, perhaps, 25, 30, 40 per cent of our wall heaters, are installed in plaster walls. Out here in the Los Angeles area, from my observations, I would guess that far more than half of the walls are made of plaster. And plaster, of course, is forced into the openings in the lath, smooth on the outside but extremely rough on the inside. Those plaster keys which plasterers depend on to hold the plaster on the lath might project in against the back of the lower box and would restrict and probably completely cut off any air flow up the back of the heater. It is also possible that the studs would not be accurately located. While they are supposed to be 16 inches apart on center, carpenters [388] may locate a pair of studs 15 inches apart or  $15\frac{1}{2}$  inches or maybe  $16\frac{1}{2}$  inches. They aren't extremely accurate. So the space on the side of the heater could also be badly restricted. So that we determined that we could not depend on an unrestricted channel up the back or the sides of the lower box.

Now, here is what would happen in the case of the Holly top design in a plaster wall that had these

(Testimony of Jack Kice.)

restrictions: Plaster keys or other surface roughness can restrict the wall space, which is the only passageway for air to the second box; and this is the only source of air on which both boxes are dependent. And the reduced air flow then through the second box can cause the excessive temperature that we are trying to guard against. I would refer to that as the, this second stage, as a hot restricted air discharge. And I think you could refer to it as a suffocated second box, because it can't get air. Of course, that would not restrict the flow of air through the lower box, which has its own self-contained air channels.

Now, I would like to get this one marked, please.

Mr. Lyon: Your Honor, I have not marked these in advance because I did not know the order, and I think it would be more confusing to be bouncing around.

The Witness: AL for identification.

The Clerk: AL for identification. [389]

(The exhibit referred to was marked Defendant's Exhibit AL for identification.)

The Court: The last one is Exhibit AL for identification, Mr. Clerk?

The Clerk: Yes, your Honor.

The Court: Have you finished your testimony as to AJ and AK?

The Witness: Yes, I have.

The Court: Do you offer them, Mr. Lyon?

Mr. Lyon: If he is finished with them, I will

(Testimony of Jack Kice.)

offer the last two exhibits, AJ and AK, as illustrative of the witness' testimony.

Mr. Christie: No objection.

The Court: They may be received in evidence.

(The exhibits referred to were received in evidence and marked as Defendant's Exhibits AJ and AK.)

The Witness: This exhibit which has been marked Exhibit AL is shown primarily to illustrate the fact that Holly's unit has the design characteristics that I have been referring to. This is an advertising man's sketch, which I presume was based on the patent drawing. But I note that he omitted the draft diverter in the advertising drawing, which of course was purely a mistake. But I produce it to show a rather odd thing here. I think we all agree that air, hot air, rises. And yet we have got some hot air arrows here that have been [390] trained to go down. They come up like so—and I will illustrate. The illustration shows them going up to the top of the stack and going down and out the grille.

Now, I am not being facetious in referring to the "trained arrows," necessarily. But we wanted to call attention to another design fault in this Holly design that we wanted to guard against in our own design. [391]

That portion is inclined to be very sluggish on air flow. It could not have normal gravity air flow in it, and from our tests it got very hot.

The Court: That portion being——

(Testimony of Jack Kice.)

Mr. Lyon: Would you mark that portion with something or other?

The Witness: All right. I will mark that with a red crayon and just mark it with the word "hot."

Q. (By Mr. Lyon): I mean the limits of the section that you are talking about.

A. I have shaded that section in red.

Mr. Lyon: Thank you.

The Court: It is a portion of the flue above the upper vent, is that it?

The Witness: That is a portion of the so-called secondary heat exchanger in the Holly design.

The Court: Above the——

The Witness: Above the outlet grille.

The Court: The upper grille?

The Witness: Above the secondary heat exchanger outlet grille.

Q. (By Mr. Lyon): Mr. Kice, in the patent is that closed at the top or open?

A. In the patent and in their actual unit it is closed at the top. Our design is entirely different, your Honor. [392]

Now, another reason for showing this exhibit is that it refutes this rather high-flown argument in the patent, couched in terms I am sure the examiner did not understand, regarding the critical velocities and the laminar versus turbulent flow, and so forth, in the flue itself.

We show here in a copy of their ad that their 25,000 B.T.U. heater has a vent size, an oval 2 inches by  $6\frac{3}{4}$ . Their 55,000 B.T.U. unit is also an



(Testimony of Jack Kice.)

oval vent 2 inches by  $6\frac{3}{4}$ . And yet it handles about 220 per cent more products of combustion than the little unit. In other words, the velocity would be more than twice as high in it, in that flue.

All of the Holly wall heaters in the entire line have the same size flue. And they even call attention to it in the text of their advertisement, that the outlet fits Type B 4-inch oval vent.

It is the same size vent that everybody in the industry uses for that size wall heater.

We use it in our Model 60, 61, and 62. There is nothing critical whatsoever about the size.

All units that I know of, all wall heater units that I know of, have a relationship between the flue and the lower box in which you can say that the lower box was substantially larger in cross-sectional area than the flue.

I believe that covers the essential points in this exhibit. [393]

Mr. Lyon: I will offer that in evidence and not restrict the offer this time, as Defendant's Exhibit AL.

Mr. Christie: We admit the authenticity as a Holly ad, your Honor.

The Court: Very well. Received in evidence.

(The exhibit referred to was marked Defendant's Exhibit AL, and was received in evidence.)

The Witness: Has this one been marked (indicating)?



(Testimony of Jack Kice.)

Mr. Lyon: I don't see a marking on it. We will ask the clerk to mark it.

The Court: Isn't that Exhibit Z?

The Witness: I thought it was, too.

Mr. Lyon: So did I.

The Clerk: The tag isn't on it, that is all. It is Exhibit Z. That is in evidence.

The Witness: I believe that this illustration, compared with the illustrations that I have just shown of the Holly, will make very clear the fundamental differences between their design and our design, which as I mentioned both go back to different patents.

Mr. Christie: May the record show which exhibit this is? I don't believe it is clear.

The Witness: Yes. Thank you. This is the sketch that was referred to a little earlier in my testimony and is marked as Exhibit Z. [394]

We do have a typical heater, and it has a ventilated flue stack. The design of the ventilated flue stack is entirely different in the way it functions, in our reasons for using it, almost any comparison that you want to make, from the Holly.

In the first place, we consider our heater design in three stages. Later I will show you a fourth stage, too, but the most important are three separate stages.

The first stage inlet is for circulation air and for the air for the burner. It enters through the lower grille and is intended for the first box only. There is also a portion of that air that is intended to flow

(Testimony of Jack Kice.)

around the lower box casing and released back into the room through the grilles in the side of the lower box casing, which I showed you earlier.

Q. (By Mr. Lyon): Do you mean the grilles 9 and 10 on Exhibit 24-A?

A. The grilles 9 and 10 on Exhibit 24-A.

The second stage is shown in green, the ventilation air passage is shown in green, and includes an independent air source built into the top of the cabinet shell.

We believe it is basically different and have applied for patent on it.

And the outlet for the second stage is the lower half of a grille mounted above the unit in the wall.

The Court: That is what we have referred to here as an upper grille, isn't it?

The Witness: We have been referring to that as the upper grille, that's right.

Now, that is a part of the economizer, but only a part of it, because the second half of the economizer is just as important. It receives air for the third stage of ventilation through the upper half of the top grille, and ventilates that on up into the attic through a vent outlet.

In our four-foot economizer model, that vent——

Mr. Lyon: Which exhibit number is that?

The Witness: Which is Exhibit 24-B, the outlet to which I am referring is in the top, as you see.

The Court: And the intake is the upper half of the grille space? Toward the center?

(Testimony of Jack Kice.)

The Witness: This is the intake of that separate passage.

Mr. Christie: May I see that, Mr. Kice? Will you refer again to the intake that you just mentioned, please?

The Witness: This is the intake, and this is the outlet for the third stage of ventilation, which is there to prevent the build-up of temperature in that space, which we found to be sluggish in the Holly design.

The Court: The intake is the upper portion of the aperture near the center of the shell of the economizer, [396] the four-foot economizer, which is Exhibit 24-B?

The Witness: That is exactly right.

The Court: The outlet is at the upper end on either side?

The Witness: That's right.

The Court: Of the flue?

The Witness: Of the flue, yes, sir.

Now, we have a similar problem in the three-foot economizer, which is indicated here as Exhibit 25-A, and we solved it in a similar manner. However, as you will see, the upper grille is divided in two halves and the aperture is divided in two halves with a divider that runs the whole way across, as in the other design. It has a ventilating passage that comes up around the flue, and an outlet opening.

The Court: It is an annulus around the flue?

The Witness: The annulus around the flue is

(Testimony of Jack Kice.)

open to the attic. The adapter plate, which we provide, is not permitted to go down over to close off the annulus. There are stops there that retain a ventilation outlet for the annulus in the third stage.

So that all of our designs have the provision for ventilating the upper half of the—the upper portion of the economizer, and prevent a build-up of temperature at that point.

I believe I am ready for my next exhibit which illustrates [397] how the Coleman design solves this very important problem of what to do about plaster walls, how to prevent the plaster keys from restricting the ventilation around the entire heating device.

The Court: This last card has been marked Exhibit AM, for identification?

Mr. Lyon: Yes.

The Court: The one to which the witness is now about to refer?

Mr. Lyon: That is right.

\* \* \* \* \* [398]

Q. Would you finish your explanation of these charts, Mr. Kice, please?

A. We were discussing the Coleman unit installed in a plaster wall, and I was bringing out the fact that even though the space up the back or the sides might be restricted or fully closed, that it still would not affect the performance of the Coleman unit, because the economizer, ventilated flue passage, is completely self-contained within the structure that they manufacture, and therefore it is under our control.

(Testimony of Jack Kice.)

There is no question about whether or not we have adequate area, and no question about the flow of cooling air through the flue.

The Court: You have before you Exhibit AM for identification? [400]

The Witness: The exhibit is AM from which I am talking.

Q. (By Mr. Lyon): Mr. Kice, have you had tests made to determine the heating efficiency of the 67 heater when that was plugged, as you have shown in Exhibit AM?

A. Yes, sir, Mr. Lyon. Our tests that we have conducted prove that there is no change in efficiency, heating efficiency of the wall heaters, of the Coleman heaters, when this is completely plugged to prevent air flow up the rear stud space.

The Court: Now, would you refer over here to this lower box of the Coleman heater, which is exhibit——

The Witness: 24, your Honor.

The Court: That black metal in there, that's the radiator, I suppose, is it?

The Witness: We call this the radiator. Or it could be called the primary heat exchanger.

The Court: Now, behind that does the air rise from the bottom?

The Witness: Yes, sir. The air rises on both sides of the heat exchanger surfaces, or the radiator surfaces, and absorbs heat from the fire inside the radiator.

The Court: That behind the radiator, how does



(Testimony of Jack Kice.)

that get out of the top of the box, of the lower heater box?

The Witness: That is the reason for this opening at this point (indicating). In other words, the air comes up [401] back of the exchanger, radiator, and comes out through the front grille, through the spaces that we provide on both sides of this, the bottleneck affair that I have been referring to.

The Court: Is the only escape from that heater box the outlets on the sides, at the top—those vents at the sides 9 and 10 on Exhibit 24-A?

The Witness: Now, this is the path that I have been discussing. The air that comes out here comes out through the main heating grille.

The Court: My question is this: That lower box——

The Witness: Yes, sir.

The Court: ——are the only two ways to get air out of that, one through points 9 and 10, the side vents, and one through the main grille?

The Witness: The primary heating is accomplished through the main grille. Now, the vents through the side are vagrant losses of heat that come out through the casing.

The Court: My question is, are those the only two points of escape for air from that lower box?

The Witness: They are the only places that air can come out, excepting for a small amount of leakage, which we have referred to in our tests. The leakage would be insignificant in the performance

(Testimony of Jack Kice.)

of the unit. And we do not depend on this leakage whatsoever in the performance. [402]

The Court: That answers my question.

Mr. Lyon: I will offer this last exhibit AM in evidence as illustrative of the witness' testimony.

Mr. Christie: No objection.

The Court: It may be received in evidence.

(The exhibit referred to was received in evidence and marked as Defendant's Exhibit AM.)

\* \* \* \* \* [403]

Mr. Lyon: I hand you the chart marked for identification AN; will you point out to the court what that illustrates?

The Witness: This chart can be covered in just a minute, sir.

We are calling attention to the fact that this unit is similar to the Model 67, this Model 68 is similar to Model 67, except that it has a rear outlet which projects through the stud space and permits air to be discharged into the opposite room. The neck of this outlet projects through whatever space there could be between the back of the unit and the inner wall [405] surface, and effectively closes off that area. That is one of the reasons why we, in the original design concept of this unit, determined that this would be more desirable in having an inlet area that was at an intermediate point, rather than to have it in that area that was dependent on a channel up the back.

I believe that is all I need to say about that.

(Testimony of Jack Kice.)

It just illustrates the advantage of the built-in air channel.

Mr. Lyon: I will ask that this one be marked next in order. This is merely proof, your Honor, that these economizers do operate from the air coming up from midway up, and do not operate from the air behind them.

The Clerk: Defendant's Exhibit AO, for identification.

(The exhibit referred to was marked Defendant's Exhibit AO, for identification.)

Q. (By Mr. Lyon): I hand you Exhibit AO and ask you what that illustrates.

A. Exhibit AO shows the Coleman Model 69 dual-wall heater, which incidentally is very similar to Model 64, the difference being in the size of the burner, the B.T.U. capacity. The 69 is a 55,000 B.T.U. input model; the 64 is a 45,000 B.T.U. input model. And, incidentally, we used a ceramic coating on the combustion chambers of the larger [406] model, permitting it to operate at a higher temperature.

Our purpose in showing this is to illustrate the very important advantage here of being able to have the independent air channel built in beginning at the intermediate point, rather than depending on a channel from the floor. Because here there is no channel whatsoever from the floor. The dual-wall model opens into both rooms and projects through the wall from one side to the other. The green shading that I have on this drawing illus-

(Testimony of Jack Kice.)

trates that in this model the air would enter through the grilles built into the top ledge of the cabinet from each room, from this side and on this side, giving us the air we need to wipe the heat from the surface of the flue, and it discharges then into the room, to one room or the other.

We built the unit in this manner to permit us to take air from either side.

Now, I anticipate an argument that we have a bracket here that is not fully closed. And the reason for that is to permit us to take the air from the adjacent wall in the dual-wall arrangement, or—from the adjacent room, the dual-wall arrangement or back-outlet arrangement. The extra air helping us to keep the temperatures down.

Now, the air that takes care of the upper section of the vent is exactly the same as it was in Model 67.

Q. (By Mr. Lyon): Mr. Kice, in all of these models, [407] 64, 67, 68 and 69, were identically the same economizers used?

A. In all of our models made, I have to refer to a date here, if I may——

Q. I mean, you used No. 4 for a period of time on all of them——

Mr. Christie: Your Honor, I believe that has already been stipulated.

Q. (By Mr. Lyon): ——and then No. 3?

A. Yes, sir.

The Court: Counsel says it has already been stipulated.

Mr. Lyon: I was pointing it out to the court.

(Testimony of Jack Kice.)

The Court: The same economizer was used in all the models?

The Witness: In the entire line, yes, sir. Except we changed from four-foot to three-foot economizers at an intermediate period here some year or year and a half ago.

Q. (By Mr. Lyon): On this 69 you actually had two of these grilles, one in each room, like 24-A?

A. The shells, what I call the cabinet shells, are identical in each room with the inlet grilles that are identical.

Mr. Lyon: I will offer Exhibits—which ones haven't I offered yet?

The Clerk: AO and AN. [408]

Mr. Lyon: —AN and AO in evidence, as illustrative of the witness' testimony.

The Court: Received in evidence.

(The exhibits referred to, marked Defendant's Exhibits AN and AO, for identification, were received in evidence.)

Mr. Lyon: I have two charts here. Will you mark these, please?

You already have. These have been marked AG and AH.

The Witness: I refer next to Sketch AH. This is a front view of the Model 67, or any of the other models we have been discussing, and I am using it because I think that it illustrates, perhaps better than the side sectional view, the paths of air flow that we depend on for ventilating the lower heater and the upper heater in separate stages.



(Testimony of Jack Kice.)

Now, this view shows more clearly the outlet grilles on each side of the cabinet shell, near the top, which ventilates the shell and the lower stud space.

The paths of air flow are illustrated by this overlay. I about ran out of colors and arrows in drawing this, but I believe that it will show up rather clearly.

I have not indicated the primary circulation of air, but only the ventilating air passages through the unit. [409]

Q. Primary, is that exhaust, the burner gases?

A. No. The primary air circulation is the air that enters the large grille here and comes out into the room through the large grille at the top of the lower heater.

Q. Oh, thank you.

A. And the red arrows that I show here is the air and the products of combustion that would pass up through the lower box, in other words, the heater itself, enters the flue, and is exhausted on the outside. I note that that opening also permits air to enter the lower portion of the heater shell, and it is indicated here by the blue arrows.

The ventilation passage would be up—looking at it in the front—it is up the columns of the outer shell alongside the grille on each side here. Part of that ventilation air also goes up between the heater and the stud. The stud I have indicated here in orange. I hope you can see it from there. The studs right there (indicating). So that there is a

(Testimony of Jack Kice.)

passageway that we keep ventilated between the lower box within the stud space and the stud. And that air is free to come out through those grilles.

The Court: By "those grilles," you are referring to the side grilles?

The Witness: Thank you. They are the side grilles near the top of the shell.

The Court: Marked 9 and 10 on Exhibit 24-A?

The Witness: Marked 9 and 10. And the space in back of the heater, in the case of the single wall, it is also open to the same outlets, and that is the area through which it is most free to get out of the unit. Remember that that area may be closed off by plaster or other restrictions, and in all cases it would be very small, even with the smoothest type of wall construction it would be a restricted passageway and would offer considerable resistance to air flow. We merely want to permit what air is heated to get out of the lower box, because we do not want that warm air to enter the upper box. We want to start with fresh air, now, because it is cooler. That is, fresh air enters the top, the intermediate grille at the top of the heater casing, which we discussed; and there are three passageways for it to take. A part of it is shown by the green arrows.

The Court: By the "intermediate grille"—would you identify that on 24-A? Would that be points 7 and 8?

The Witness: As shown by 7 and 8 on Exhibit 24-A.

(Testimony of Jack Kice.)

The intermediate grille permits air to enter. And the green arrows show that a part of the air is going through the economizer annular passageway that surrounds the flue,—this is inside the economizer—carrying the heat that would be emitted by the flue surfaces out into the room through the lower half of the economizer grille.

The purple arrows illustrate the air that is permitted [411] to flow alongside of the outside surfaces of the economizer to keep the upper stud space flushed of heat. And that air is allowed to enter that space through those holes that we provide in the mounting brackets, rather large size holes in comparison——

The Court: Rectangular holes to either side of the flue? Is that it?

The Witness: Well,  $\frac{3}{4}$  inch diameter holes, that I am attempting to show; rectangular holes that permit the air to enter the economizer. But the others, smaller amount of air to flush out the heat that might be emitted from the outer surface of the economizer.

The Court: That air discharges into the attic, is that it?

The Witness: That is right, sir. The air coming up the outside would go out into the attic, where codes permit an opening to be there. Now, if the code would not permit that opening, it would not give us dangerous temperatures. We can have this area closed off snugly and still operate cool because

(Testimony of Jack Kice.)

of the amount of ventilation that we are throwing through the interior annulus. It is simply to our advantage to keep it as cool as possible.

That, incidentally, is a rather important point that I want to make; that all the way through within our design we are attempting to keep this thing cool. We are not attempting [412] to use it as a heater.

The Court: By "this thing" you are referring to the so-called economizer?

The Witness: Thank you. The economizer is not attempted to be used as a heat exchanger, in an important sense of the word. We simply economize what heat there might be available to us, and it is of a much smaller order than in the Holly arrangement. The final passage of ventilation air, which I would illustrate here by the brown arrows, enters the upper half or upper portion of the economizer above the divider, and this upper half of the grille then permits the air to enter here and then discharge through the top opening of the annulus into the attic. If it should be—that is a relatively large opening in the 4-foot economizer; probably larger than was necessary, sir. Enters through up here through the annulus and out into the attic. In the 3-foot economizer we reduced the size of that opening, but still have all that we need for the much shorter portion of flue that we are trying to cool.

The Court: You have referred to a radiator as a heat exchanger. Is that the terminology of the trade?

(Testimony of Jack Kice.)

The Witness: We refer to the lower radiator, in language of the patent, as a primary heat exchanger.

The Court: When you use that term "heat exchanger," are you using a term that is common in the trade? [413]

The Witness: Yes, sir.

The Court: Is it synonymous to radiator?

The Witness: More commonly called a heat exchanger than it is a radiator.

The Court: Is there a difference, or is that just a new term?

The Witness: In the language we have been using here they would be synonymous. Now, I do not believe that the secondary heat exchanger that Holly refers to, however, is synonymous with what we call a ventilated flue stack, inasmuch as they have deliberately designed, in my opinion, sir, the secondary—the lower radiator or primary exchanger somewhat smaller, and with less heat exchange capacity than we do. Because, they do depend on their secondary heat exchanger for a part of the exchange of heat between the flue gases and the air; a rather considerable part. And we are not dependent on that to operate satisfactorily. We are merely interested in ventilating that flue.

The Court: You both salvage that heat, so to speak?

The Witness: That is right.

The Court: And try to put it out in the room, and it does double duty; one, it is depended upon



(Testimony of Jack Kice.)

to heat the room, No. 1; and it tends to cool the area surrounding the lower heater, No. 2.

The Witness: That is right; just as Browell did in 1882. [414]

I would say that that about covers my exhibits.

Oh, I believe I have one more here which was Exhibit AH, already marked. And I would just like to make the comparison perhaps just a little more clearer in the action that takes place between—as comparing Coleman, as I have just done, and all of the paths of air flow that we provide to get three or four stages, depending on how you want to turn the stages; but at least three stages of ventilation cooling.

The Court: This chart is Exhibit——

The Witness: This chart that I am showing you here is AH. Oh, excuse me. The chart that I just mentioned was chart AG. Yes, sir. It shows the Coleman circulation.

The Court: That's the chart you last testified about, is it, AG?

The Witness: Chart AG was the one I was just discussing before we went over to look at the exhibit——

The Court: The chart you now have before you, AH?

The Witness: That is correct.

The Court: That involves a Holly heater?

The Witness: This shows the Holly heater that they built in and depend on. This shaded portion here would be the lower box. This darker cross

(Testimony of Jack Kice.)

hatched section is their flue or, as they would call it, the secondary heat exchanger, surrounded by a ventilation shell or annulus.

Now, they do not provide any built-in passage at all in [415] the lower section but depend on air entering through the lower grille or the—there is actually not a grille there. They just mount the unit up above the floor and the skirt covers an opening in the bottom. The grille in the front, I believe, is merely for burner air. Air comes up through here and would be free to go up through the stud space at the side of the unit in the single wall model. I frankly don't know how they get the air up the unit for the dual wall models; but I will not attempt to explain that. Air can come up through here (indicating). Now——

The Court: "Here" being the annulus between the lower box and the stud, is that right?

The Witness: One of the paths is between the lower box and the stud, and the other path that I have attempted to illustrate is merely in the column area at the side of the shell.

The Court: By that do you mean the area between the radiator and the wall of the shell?

The Witness: I believe I can illustrate on their exhibit better.

This space which would be alongside of the lower box.

The Court: Between the outside of the lower box and the inside of the trim, is that right?

The Witness: That is correct; between the out-

(Testimony of Jack Kice.)

side of the lower box and the inside of the shell or trim. It provides—— [416]

The Court: Shell or trim being Exhibit——

Mr. Lyon: 20-A, I believe, your Honor.

The Court: 20-A?

Mr. Lyon: What is the tag on there, Mr. Kice?

The Court: Exhibit 20-B, would it not, called “panel”?

The Witness: 20-B is the identification.

The Court: The shell is 20-A. That is the secondary heater.

The Witness: Now, that would be ventilated, just a small area of ventilation permitted at the top of the trim, as I understand their design.

The Court: I said Exhibit 20-A. It is Exhibit 20. The lower box, the radiator, Exhibit 20, Holly.

The Witness: Thank you. Now, the air that I have just been referring to has only one outlet, which is the grille in the economizer. Excuse me. The grille in the secondary heat exchanger, which I will shade up here in blue. The path of flow then has to come around the solid brackets that they provide, and would come out of the grille into the room as I have shown here in the blue lines, and will indicate with arrows at the extremities.

The Court: That is the upper grille?

The Witness: That is the upper grille of the Holly secondary heat exchanger. The flow of air around the flue, which they referred to as the secondary exchanger, would be [417] somewhat as I have shown with the spiral lines, I believe. There is

(Testimony of Jack Kice.)

some question in my mind as to what occurs in this more or less stagnant portion above the grille. But I would presume that part of that heat would find its way out of the grille. A part of it would find its way as conduction and convection through the wall. And that single stage is the Holly arrangement and the multiple stage is the Coleman arrangement.

The Court: Now, with respect to the Holly, where do you say the air comes from that is emitted from the upper grille?

The Witness: The Holly unit depends on its air supply from the opening near the floor; and is dependent on a channel being provided by the carpenter or the plasterer between the lower portion and the stud space.

The Court: In other words, it is your understanding that all the air which is emitted from the upper grille must come from the space between the studs and the heater, exterior of the heater box?

The Witness: That is my understanding exactly. And it is the way I read their patent.

I don't believe there is anything else. [418]

The Court: None of it can come from the so-called lower box proper, the interior of the lower box?

The Witness: No, your Honor. The air supply for the secondary heat exchanger must come from the space outside the lower box, between it and the stud space.

(Testimony of Jack Kice.)

The Court: By the lower box I mean Exhibit 20, and you so understand it, do you?

The Witness: Does Exhibit 20—that includes this? Yes, sir.

The Court: It does not include the trim?

The Witness: They could get a little air up through the columns of the trim.

The Court: Up into the——

The Witness: Up into the space above the lower box.

The Court: Up into the heat exchanger?

The Witness: Up into the secondary heat exchanger, yes. But there would be no chance for additional ventilation air outside the box.

As a matter of fact, their instructions specifically show a situation where the stud space may be deeper than their bracket. If the stud space is deeper than the thickness of this bracket, they provide for a strip of wood to be nailed——

The Court: You are referring to the base of Exhibit 20-A, the secondary heat exchanger?

The Witness: That is what I am referring to.

The Court: I referred to the trim just a moment ago. I mean the panel or shell.

The Witness: I have been calling it the shell.

The Court: Exhibit 20-B. You so understood it?

The Witness: That is the way I understood it, sir.

You will note that this bracket that I have been referring to at the base of the secondary heat exchanger is completely solid, no openings, and the



(Testimony of Jack Kice.)

instructions call out that if the stud space is deeper than the width of this bracket, that a piece of wood should be built in there, or some other closure, so that the air cannot—so that all of the air has to go up through the annulus and is not permitted to go up here.

We specifically want air to go up in here to flush out the upper stud space of heat, if it is possible to do so.

You will note, too, that there are no openings at all in the top of the secondary heat exchanger, and the upper box is one continuous space without any division whatsoever.

The Court: In both your last statements you refer to Exhibit 20-B?

The Witness: That's right.

Mr. Lyon: That is 20-A that you are referring to.

The Witness: 20-A is the secondary heat exchanger.

I would call your attention, too, to the difference in the size of the grilles there. [420]

Q. (By Mr. Lyon): Mr. Kice, I don't know that the court understood it or not, but in neither the Coleman or Holly heater, as exemplified by any of the exhibits here, does any of the air from the inside of the lower box find its way into either the economizer or the secondary heat exchanger?

A. The air that would come up through the primary heater, through the large inlet grille from the room, and then after it is heated back out into the room through the large supply grille, cannot—

(Testimony of Jack Kice.)

Q. Neither of these heaters rely on that air that goes on the inside, around the first radiator—it is not used in any effective way at all in the economizer or the secondary heat exchanger, is it?

A. There is no way for it to get in there directly. The only way would be indirectly.

The Court: It is my understanding, gentlemen—you correct me if I am in error—that in neither one of the devices is it intended that any of the air directly heated by the lower box and in the lower box shall go into the upper box?

Mr. Lyon: That is right.

The Witness: That is right, your Honor.

The Court: It is intended that the air heated in the lower box be emitted through the main grille in front?

Mr. Lyon: I will agree with that statement. [421]

The Court: Is that your understanding?

Mr. Christie: That's right.

The Witness: It would be possible that air could come out here and be reheated here, but it wouldn't be intentional.

The Court: It would be room air once it comes out of the heater?

The Witness: Yes, it is room air.

The Court: I suppose it is possible that you get this same air three or four times in the course of a very few moments, depending on the air current; wouldn't it be?

The Witness: That's right, sir.

(Testimony of Jack Kice.)

The Court: There is no way of measuring that, I don't suppose.

The Witness: It would be very difficult.

The Court: Unless you could color the air in some way.

The Witness: My reason for answering the question in that way is because I believe there has been some misunderstanding of the air currents that went into our exchanger, because of certain smoke tests in which there was some recirculation that come out through the outlet grille of the heater into the room and then bypassed back into the inlet of the economizer, it could be very easily misunderstood as to what went on there without a full understanding of what it is for. [422]

Mr. Lyon: I will offer AH and AG in evidence as illustrative of the witness' testimony.

Mr. Christie: No objection.

The Court: Received in evidence.

(The exhibits referred to, marked Defendant's Exhibits AG and AH, for identification, were received in evidence.)

Q. (By Mr. Lyon): Now, Mr. Kice, were you present at the taking of the deposition of Mr. Landsberg—what was the date of that deposition?

Mr. Hoegh: July 26 and 27th, 1954.

Q. (By Mr. Lyon): —July 26, 1954?

A. Yes, I was, through the entire deposition.

Q. Who else was present at the taking of that deposition?

A. Mr. Warren Blazier from the Foundation

(Testimony of Jack Kice.)

for Industrial Research of the Wichita University, and yourself, Mr. Hoegh, Mr. Hollingsworth, and of course Mr. Landsberg and his assistant whose name I don't remember. It began with a "P."

Q. Do you recall anything concerning the method of supplying SO<sub>2</sub> to the furnaces during that test?

A. My impression was that there was no regulation that was at all under control. The assistant operated the handle of the control valve on numerous occasions during the [423] test.

Q. When Mr. Landsberg didn't get a result, did he ask his assistant to adjust the SO<sub>2</sub> supply?

A. Yes, he did.

Q. Several times, didn't he?

A. Certainly more than once. [424]

\* \* \* \* \*

Mr. Lyon: If your Honor please, I overlooked two exhibits that should have been marked as Exhibits A and B. Exhibit A is the abandoned application of John H. Hollingsworth and Karl A. Bedell, which I will offer as Exhibit A.

The Court: Is there any objection?

Mr. Christie: No objection.

The Court: Received in evidence.

(The document referred to was received in evidence and marked as Defendant's Exhibit A.)

Mr. Lyon: And Exhibit B is the file wrapper of the patent in suit, which I will offer as Exhibit B.

The Court: Is there any objection?

Mr. Christie: No objection.

The Court: It may be received in evidence.

(Testimony of Jack Kice.)

(The document referred to was received in evidence and marked as Defendant's Exhibit B.)

### Cross Examination

Q. (By Mr. Christie): Mr. Kice, would you tell me what the procedure is when you install a No. 67 heater of the Coleman Company, including the economizer, in a wall? What is the standard procedure, as you know it?

I will ask you the question more specifically. Is the wall finished before you put the lower box in?

A. Sometimes the wall is finished and sometimes it is not. More commonly it would be installed after the wall is finished, however.

Q. After the wall is finished? A. Yes, sir.

Q. Now, after the wall is finished, the plaster keys, if there are any, are hard and dry, isn't that true? A. Yes, sir.

Q. Now, on the back of the lower box, which is Plaintiff's Exhibit No. 24, do you find some ribs?

A. Yes, sir. Those spacer ribs are required by AGA, to prevent contact of the box against any inflammable material.

Q. Now, we have the same sort of ribs, do we not, on Exhibit No. 25? A. Yes, sir.

Q. And we have, do we not, the same sort of ribs——

Mr. Christie: I will withdraw that.

The Witness: I do not see them.

Q. (By Mr. Christie): Now, would not those hard ribs, those ribs that you have just identified



(Testimony of Jack Kice.)

on the Coleman lower box, about the plaster keys?

A. The plaster keys are very irregular and there is no assurance that the ribs would prevent contact of the casing against the wall. [426]

Q. But that is what they are there for, isn't it?

A. The purpose is to prevent contact with inflammable materials, such as wallboard.

Q. If they did come in contact with the plaster keys they would hold the box away from the plaster keys?

A. Undoubtedly the installer would knock out the little pieces of plaster that prevented the unit from going into place where they interfered with——

Q. Have you seen this happen?

A. Yes, sir, I have done it myself.

Q. Now, Mr. Kice, I ask you to look at Defendant's Exhibit AM, and I direct your attention particularly to the irregular black material at the rear of the wall—it is marked "wall" in the upper right-hand corner. Will you tell me what that is in this black line?

A. The irregular material indicated by the black irregular line?

Q. Yes. Did you prepare these drawings?

A. I drew them myself.

Q. What did you mean to indicate by this irregular black line?

A. Any irregular surface such as plaster on wood lath or metal lath.

Q. Metal lath or wood lath?

(Testimony of Jack Kice.)

A. Yes, sir. [427]

Q. Now, I believe you testified this morning that metal and wood lath are used to a great extent in housing construction——

A. Yes, sir.

Q. ——did you not?

A. Yes, sir.

Q. Have you any idea to what extent metal and wood lath are used in residential construction of the type where wall heaters are installed?

A. Well, of course, wall heaters are installed in all types of houses, old and new, and small ones and large ones. But usually in large houses they are installed as supplementary heating. But the market is divided a great deal. It is our opinion, which I would be unable to verify, that it would—I believe I said around a third of the—I believe I said from 25 to 30 per cent. I am not sure. The figure that we think is important enough that we need to provide for it, since you can't afford to have very many houses operated under hazardous conditions. If the value were less than I mentioned, it would still be important.

Incidentally, the use of wallboard is a rather spotty thing. In cities like Chicago, which happens to be a large part of our market, there is very little wallboard used for the simple reason that the Building Trades Unions have more control. [428]

Q. You would say that wood and metal lath plaster constitutes approximately 25 to 30 per cent of the residential installations in this country?

A. I used that figure merely to indicate that in our opinion it was an important amount. And I

(Testimony of Jack Kice.)

don't believe that it is possible to put an exact figure on it.

Mr. Christie: I will ask the clerk to mark a document of the United States Government entitled, "Housing and Home Finance Agency, Office of the Administrator, Division of Housing Research," as plaintiff's exhibit next in order.

Mr. Lyon: Is that what you gave me a photostat of?

Mr. Christie: That is right.

The Court: That would be 13, Mr. Clerk?

The Clerk: Yes, sir, 13.

(The document referred to was marked Plaintiff's Exhibit No. 13 for identification.)

Mr. Christie: May I stand here, your Honor—

The Court: Yes.

Mr. Christie: —momentarily?

Q. I call your attention to page 11, to the lines entitled, "Gypsum, wood and metal"—these constituting lines 3, 4 and 5 of the tabulation—and I ask you to tell me whether this agrees with your calculation, or estimate?

A. I believe this entire survey is based merely on new construction; does not take into account old construction whatsoever. [429]

I would certainly agree that there is a trend in new construction practice away from wood and metal lath. [430]

Q. Now, do you notice that the columns marked wood and metal have asterisks in them?

A. Yes, sir.

(Testimony of Jack Kice.)

Q. At several points? A. Yes, sir.

Q. And would you now refer to page 6, to the heading entitled, "Table 2 Structural Characteristics," and if you don't find out that an asterisk indicates that the percentage is less than .5?

A. I see that. However, I see another figure that gives for wood lath and plaster 37 per cent, for gypsum lath and plaster 62 per cent.

Q. Will you confine yourself——

A. There are keys, of course, through gypsum.

Q. Will you confine yourself momentarily to the material that I am asking you about at the top of page 11?

A. It is a part of the table that you showed me, sir.

Q. Does it not say—First, you find a column which is marked "1940 United States Average," is that correct? A. That is correct.

Mr. Lyon: If your Honor please, this is not proper cross-examination. He is having this witness read——

The Court: Is there any question about the figures that are in that pamphlet?

Is the defendant willing to accept them? [431]

Mr. Lyon: I don't know whether they are right or wrong.

The Court: It is a Government publication, and in the absence of evidence to the contrary I would accept them.

Do you offer it in evidence?

Mr. Christie: I offer it in evidence.